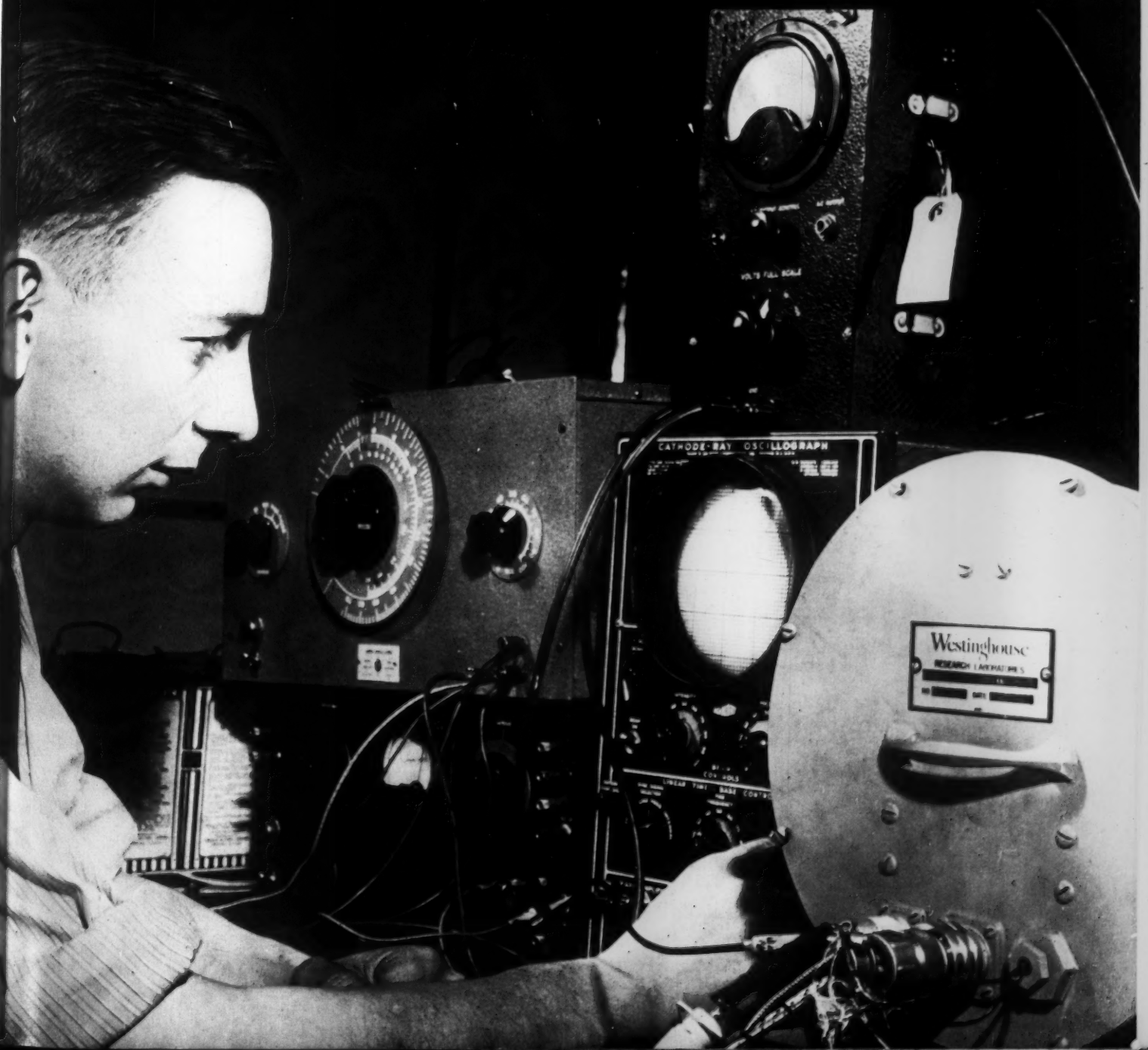
Vol. 19 JULY 1946 No. 7

Instruments

THE MAGAZINE OF Measurement and Control



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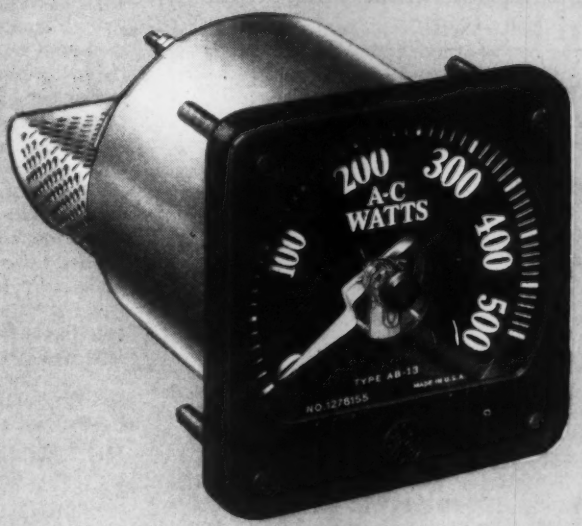

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Instruments
THE MAGAZINE OF Measurement and Control

Vol. 19 July 1946 No. 7

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(Courtesy Westinghouse Electric Corporation)

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Published Monthly on the 15th by
THE INSTRUMENTS PUBLISHING COMPANY
1117 Wolfendale Street, Pittsburgh 12, Pa.
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Subscription: U. S. and possessions: one year $2.00, two years $3.00. All other countries, including Canada, one year $7.00, three years $14.00, payable in advance (remit by New York draft).

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Instruments THE MAGAZINE OF Measurement and Control

M. F. BEHAR, Editor

Will the ISA Conference Usher in a New Era in Instrumentation?

FROM a few glances at just-released publicity giving the titles of a few of the papers to be presented before the ISA Instrumentation Conference in September, it is certain that IMPORTANT DISCLOSURES WILL BE MADE.

To be sure, none will make front-page headlines. The fifty-odd lecturers are not expected to disclose achievements on a par with FM, penicillin, nuclear fission, silicones, JP, radar, transuranic elements, DDT, color television, the betatron, resnatron and other particle-accelerating instruments; or theories on a par with Einstein's; or discoveries on a par with Stern & Estermann's molecular rays.

Neither are these lecturers expected to announce fireless cookers, cordless irons, runless stockings, glareless headlights or other popular items (which rate bigger headlines than scientific achievements).

And it is unlikely that new commercially-available measuring and automatic-control instruments will be announced: some of them will be on display in the Exhibit—in most cases for the first time; all of them are or will be promptly reported in our New Instruments Department; and the Conference lecture platform will probably not be used for commercial plugs.

Indeed, it may well be that the greatest disclosure—the one which will most profoundly influence the future of Instrumentation—will be entirely overlooked by the newspapers and will receive only a few lines in the immediately-following issues of most technical magazines serving other fields than the one with which the lecturer's name is linked. Perhaps this "greatest" disclosure will have little influence even in the lecturer's own special field.

We are not thinking of any particular individual or Conference topic; we are thinking of history, of the years it took for great contributions to win acceptance outside of small circles of specialists.

Fortunately, this handicap of small-circle obscurity will be removed to some extent by the application of modern publicity methods. Preparations are being made to have reporters from newspapers as well as from technical magazines and scientific journals "cover" the Conference. Before the Conference opens, summaries of most of the lectures will be available on request and will be mailed to news syndicates and to technical magazines and scientific journals. Advance copies, complete with illustrations, will be printed as early as mid-August for some of the foresighted authors who will have finished their texts and diagrams by mid-July. Naturally, the September issue of *Instruments* will be a special one, containing the complete program and other special features. As we go to press we learn that *Electronic Industries* will also bring out a Special Instrumentation Issue in September and that other technical magazines will give generous space to the ISA Conference.

Everything is being done to publicize and dramatize the messages to be delivered by at least fifty prominent engineers, scientists, educators and industrial executives. Even the official name, "Instrumentation for Tomorrow," was adopted because of its ACCURACY as well as because of its publicity value. Notices to members of the ISA and of scientific and engineering societies participating in the Conference, as well as public notices, will assure a large attendance from outside Western Pennsylvania. (We've just learned that four Californians have written for hotel-room reservations.) In short, earnest efforts are being exerted to make the great Conference usher in a new era in Instrumentation.

Do you think it will?

Whether you answer yes or no, events will prove to your satisfaction that you were right. A logical prediction would seem to be—

But before stating this prediction, it is in order to look into why it so often took years or decades for great contributions to science and technology to win wide acceptance. Lack of modern communication facilities is the stock answer; and when this answer is doubted, the case of Mendel* is pulled out like an ace-in-the-hole to squelch the doubter.

We've had Mendel pulled on us lots of times and we still doubt the stock answer. We believe, as does a tiny minority, that if Mendel's paper had appeared simultaneously (and without alterations) in all German-language horticultural and other natural-science journals and if exact translations had appeared in all French, English and American natural-science journals, it would only have given the good abbot an enormously greater amount of "name publicity" and would not—as is claimed today—have triggered off in 1865 the new era in genetics which actually began four decades later. We believe that this "IF" is absurd because such publicity would have been refused in 1865: the few real biologists and the many scientific florists and farmers on the scene in 1865 were not ready to accept Mendel's new IDEAS.

The case of Mendel is the classic example. All it proves is the usefulness of technical libraries, of translators, abstractors, reviewers, etc., in preventing what Dr. Ellice MacDonald, a modern biologist, calls "that crime against research, duplication of effort." It does not prove that human nature is changed when an important disclosure is made to many large circles instead of to one small circle. It does not prove that the mere EXISTENCE of modern publicity facilities can make any great NEW idea—any great new IDEA—penetrate human skulls faster or more easily: the greatness of an idea is seldom perceived by those who manage or make use of the public-opinion industry.

Here, then, is why the title of this editorial is interrogatory instead of declaratory. Here, then, is why either yes or no is the right answer:

Certainly, the IDEAS to be disclosed during Instrumentation Week will have the potential ability of ushering in a new era. Probably, they will cause it slowly to emerge—no trigger effect!

Possibly, the new era will not be recognized as such until these ideas permeate the world of technology from the printed page to the production line, until they find expressions in newer and more improved methods, in still better things and still better ways of living.

Before these results of the 1946 Instrumentation Week are fully felt, the ISA's 1947 Conference in Chicago will be over; and *its* ideas will be fermenting another new era in Instrumentation. The ISA's 1948 Conference will likewise . . . Yes, but bear in mind that the new era OF Instrumentation is already here. Specifically, the grimy Age of Machinery which was not free from evils has already given way to the Age of Instrumentation which is making Technology a pure blessing. —MFB

*Johann Gregor Mendel, the Austrian monk who in 1865 announced his discovery of two of the mathematical laws of heredity but did not call them such and did not know (no one knew) their universal applicability and their importance in mammalian breeding. From 1819 to 1861, prizes had been offered for solutions of problems of pollenization, etc., in agriculture (and incidentally in floriculture, horticulture, silviculture, etc). Mendel's paper, *in an Austrian horticultural journal*, got little notice among the thousands written in that period.

Diaphragm Control Valves*

By BRUCE IRWIN, Hammel-Dahl Co., Providence, R. I.

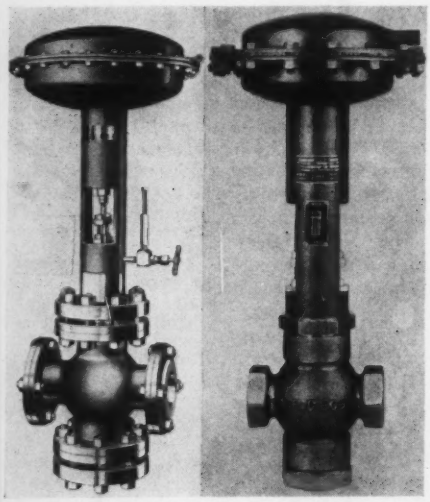
MANY control specifications go into multitudinous instrument details as to range, chart drive, instrument sensitivity, accuracy of pilot output, pilot capacity, deviation from the mean, hysteresis, and so on, but they generally end up by saying, "One 4" control valve, extra-heavy cast-iron flanged body, stainless steel trim." Regardless of how well the instrument can measure the condition to be controlled, unless the control valve does exactly what the instrument commands, you have an unsatisfactory control installation. Let us, therefore, examine this thing called a diaphragm control valve to see (1) what it is, (2) how it functions mechanically, (3) what we mean by valve characteristic.

Basically, a diaphragm control valve is a means of introducing a variable resistance into a fluid flow system. Under low flow conditions, the control valve must dissipate energy in the form of pressure drop across the valve plug to permit the desired flow rate. When high flow rates are demanded, little energy is dissipated. The variation in energy absorbed by the control valve is governed by its ability to vary port area. A definition of a control valve might then be "The means of introducing variable resistance into a fluid flow system" or, as Ed Dahl facetiously classifies it, "An engineered obstruction in a pipe line."

Actually, mechanically, most control valves consist of a valve body with a valve plug and stem attached to a diaphragm. The diaphragm is enclosed in a diaphragm case generally mounted on a spring barrel. Air loading on the diaphragm is balanced by some external force, generally springs. Variation in air loading pressure from the control instrument will cause the diaphragm to move. As this is connected to the valve plug, the valve plug will assume variable positions in relation to the seat of the valve body. For this reason, I might define a control valve as a "Diaphragm-operated Variable Orifice." As most of our discussion this evening will relate to control of fluid flow, I should like to use this simile of calling a diaphragm control valve a "Diaphragm-operated Variable Orifice," being careful to point out that an orifice need not be circular in cross section. Slide No. 1 shows at the left a flanged-end control valve with through-bolted bonnet and blind flange; and at the right a screwed-end valve.

For the purpose of clarification, I should like to mention the more common types of construction of control valves, merely to define the term for purposes of discussion. Any mention of the term "control valve" may be considered to refer to any of these diaphragm-operated valves: (a) Single-seated, such as piston, needle, wedge, or step cone; (b) Double-seated, or balanced, such as parabolic, V-port or annular type; (c) Free-flow Venturi throat; (d) Pressure-balanced; (e) Three-way; (f) Butterfly 30°, 60°, 90° and V-port; and (g) Saunders Patent (Hills-McCanna).

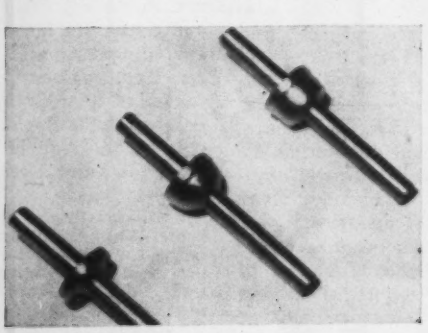
There are two basic types of control valve action: "air-to-open" and "air-to-close." In former years, the terms "direct-acting" and "reverse-acting" were used but, owing to diametrically opposite use by various manufacturers, these terms have been largely dropped. In most cases, the pressure variation applied to the diaphragm to stroke the valve completely is normally 0-15 lbs./in.^{2}, although practically, it will run about 2-14 lbs./in.^{2} to insure: (1) definite spring closing in the air-to-open type; and (2) that the 15-lb. output of the controller will tightly close or completely open the valve.



Slide 1

Actually, the spring range of the diaphragm control valve must match the instrument pilot range.

While the more usual range of valve loading is 0-15 lbs./in.^{2}, some manufacturers use a 0-25 lbs./in.^{2} range. Regardless of the pressure range, the diaphragm valve is supposed to position the valve plug in a definite reproducible position for a given loading pressure sent from the control instrument. It also should respond to the most minute change in output pressure from the control instrument.



Slide 2

Let us assume that we have a perfect diaphragm superstructure and a frictionless stuffing box on the valve body. Based on this assumption, the most important factor of control valves left to discuss is "Control Valve Characteristics," which is the subject of this talk. In general, the three most common valve characteristics are: (a) *Quick-opening;* (b) *Linear;* and (c) *Equal percentage or logarithmic.* Slide 2 illustrates each of these constructions in solid plugs, which operate on an annular basis, although the same characteristics could be equally well produced by a V-port plug or several other types of construction.

The question of control valve characteristic, briefly stated, is, simply, "How does the valve act?" In the beginning, control valves were made with quick-opening or bevel-seated valve plugs, single or, preferably, double-seated. The lift in these valves was generally ¼ D, D being the seat diameter. Valve lift was arrived at by dividing the seat areas $\pi D^2/4$ by the seat perimeter πD, giving the maximum useful lift of $D/4$. The flow curve generated is a straight line at constant pressure drop through most of the travel.

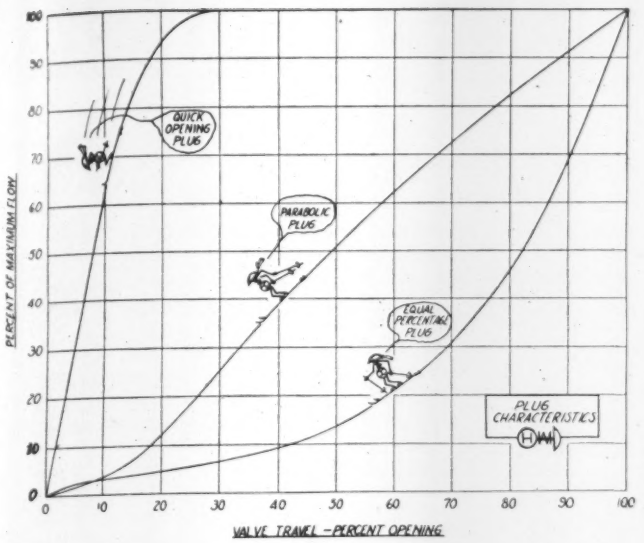
As long as thirty years ago, it appeared easier to control flow by increasing valve lift. Consequently, a double-seated skirted type plug with four equilateral triangular ports in each skirt was manufactured. While the word "V-port" describes the construction accurately, the valve port area as a lift relationship actually produces a parabolic curve. The lift is generally several times that of bevel-seated plugs.

Approximately fifteen years ago, the solid-type parabolic plug was introduced. The plug contour and flow behavior produced at that time can be accurately described as parabolic. The lift of this valve was several times that of a bevel-seated plug, but generally less than a V-port.

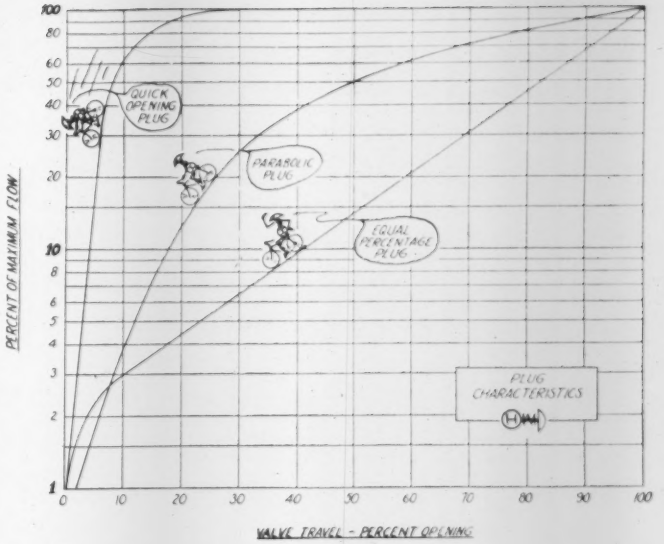
Present-day thinking has swung to a large extent from the parabolic-type flow curve to the equal-percentage flow curve. The term "equal-percentage" is used quite commonly when speaking of control valve flow characteristics. Unfortunately, however, there have been many varieties of definitions for this characteristic and there is a great deal of confusion as to its basic advantages.

An important function of the equal-percentage valve is its consistent behavior under conditions of varying flow

*Presented at the Spring Meeting of the Instrument Society of America, Detroit, Mich., April 4, 1946.



Slide 3



Slide 4

and pressure drop. This may be traced directly to the equal-percentage flow characteristic. Because of this fact, a brief description is included, covering in simple outline the fundamental reasoning underlying this important concept.

Consider the following definition carefully:

A valve having an equal-percentage flow characteristic will produce a change in flow, for a unit change in lift, which is proportional to the quantity flowing just before the change is made.

When the flow is small, the change in flow is small. When the flow is large, the change in flow is large, for the same increment in valve lift. The change is proportional to the quantity flowing.

I should now like to show you some slides illustrating the flow characteristics of the various valve plugs mentioned before, inasmuch as you have already seen the physical appearance of the valve plugs which produce them.

Slide 3 is a characteristic plot on uniform coördinates of a quick-opening plug, a parabolic or linear plug, and an equal-percentage valve plug. You will note that the quick-opening plug generates a straight line for about 70% flow and that the valve travel is only 30% of the other types. This type of plug is satisfactory with constant pressure drops or on open-and-shut service. The parabolic or linear valve plug gives about 50% capacity at 50% opening. The equal-percentage plug gives about 13% to 15% capacity at 50% lift or opening. I should point out again that the actual lift in inches of the parabolic and equal-percentage curves is several times that of the linear plug.

Slide 4 shows exactly the same information as Slide 3, but plotted on semi-logarithmic paper with the flow scale divided into two sections (called "cycles"), one covering a range from 1% to 10%, the second from 10% to 100%. This type of graph, like a slide rule, gives the same percentage accuracy regardless of the magnitude of the number. Several advantages are gained by this type of plotting:

(1) Equal-percentage curves plot as a straight line or a constant rate of change.

(2) The steepness of the line indicates the rate of change of flow.

(3) For 1% change in lift, the percentage plug port gives a 4% change in flow.

(4) Rangeability, or ratio of maximum to minimum controllable flow, is clearly shown.

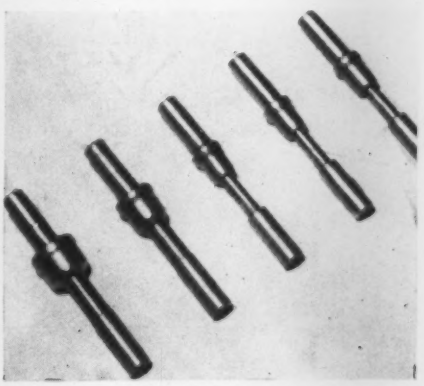
(5) Also shown is that the parabolic or linear curve is actually a square-root curve with a varying rate of flow for different lifts.

(6) The quick-opening plug still generates a straight line, but only over a very limited valve travel or percentage opening.

The information, however, is still entirely qualitative.

In order to present valve characteristics in terms of actual lift and actual flow units, the idea of a valve coefficient (C_v) for control valves was conceived. The valve coefficient is to the control valve as the orifice meter coefficient is to orifice meter flow measurement.

Let us briefly review Webster's definition of the word "coefficient": "Any constant quantity or number placed as a multiplier before an unknown or a variable quantity of an expression containing one." An example familiar to all of you is the practical orifice meter formula for liquids, $Q = C\sqrt{h}$.



Slide 5

Q = Liquid in g.p.h. at 60°F.

C = The coefficient or quantity of liquid flowing through the orifice when there is 1" of water differential.

h = Differential in inches of water.

This formula is exactly the tool we want for valve work, but the units are not suitable. Convenient units for the flow coefficient of a control valve are gallons per minute and pounds per square inch pressure drop. Using water and a constant unit pressure drop of 1 lb./in.^{2}, the resultant flow at any valve lift is designated as flow coefficient (C_v).

The basic value of C_v is the same for liquids, gas and steam. If the flow conditions are known on either liquid, gas, or steam, the flow coefficient C_v can be computed directly by means of formulas which will be stated subsequently. If, for example, C_v was determined from a set of conditions on steam service, it can be used to determine capacity on either liquid or gas. The valve coefficient with the plug at maximum lift (valve fully open) accurately expresses the actual port area of the valve and is a number which can be used to state the valve's capacity.

A control valve which has a maximum C_v of 10 is one with port area which will pass 10 g.p.m. of water at 1 lb./in.^{2} drop. This happens to be a 1" control valve. The numerical value of C_v simply expresses the number of gallons per minute flow which would result for 1-lb./in.^{2} pressure drop. As control valves are built in rational sizes above 1", $C_{v\max}$ for a 2" valve would be $2^2 \times 10 = 40$; for a 4" valve, $4^2 \times 10 = 160$; for a 10" valve, $10^2 \times 10 = 1000$.

Slide 5 illustrates the constructional features of a family of five equal-percentage annular plugs, which have consistent flow behavior. Their principal features are: (a) A series of angular cuts on a piston plug which can be reproduced in any instrument shop in an emergency; (b) common seat-ring,

O.D.; (c) two seat sizes only, which require only a plug and stem change to change capacity; (d) high lift (½" in all sizes); (e) related maximum flow capacities; (f) reversibility from air-to-open to air-to-close action by reversing valve body; (g) tight shut-off; and (h) top and bottom guiding.

Slide 6 plots valve lift in inches versus C_v—Flow coefficient of the family of quintuplets shown on Slide 5. We now have quantitative information and a definitely more useful type of curve than either Slide 3 or Slide 4. In addition to the information given by Slide 4, we find the following: (a) The relative capacity of the various valves; (b) the ability to calculate accurately valve lift in inches at intermediate and low flows; and (c) a means of numerically expressing actual valve capacity.

Let us assume we have selected a ½" valve with a C_v of 4 as being suitable for maximum flow conditions, but wish to see what it will do at minimum flow conditions, namely 1 g.p.m. of water at 25-lb. pressure drop. The C_v calculates $\sqrt{(1/25)}$ or 1/5 or 0.2. You will note a ½" valve will have a lift of 0.12" at this flow rate.

Slide 7 plots the percentage of maximum lift versus C_v for double-seated percentage plugs in sizes 1" through 12". These curves will permit the same type of analysis as mentioned for the equal-percentage annular plugs. In sizes 6" and over, a skirt-type valve plug which produces the same flow characteristic can be used. When the valve lift is known, it is possible to calculate the valve capacity at any point of valve travel.

Slide 8 illustrates the equal-percentage annular plug used to produce the curves shown on Slide 7. This solid type plug is usually made from a drop forging, using a forming tool for machining. It can also be fabricated from bar stock and machined in the field. Its shape is such that no material can stick to its surface. It has a great many strong adherents in the chemical and petroleum industry. The best way to insure accuracy of contour is to use an optical comparator, as illustrated on Slide 9.

I will now list the basic flow formulas to determine valve capacity with C_v and the flowing conditions given:

LIQUID:

$$\text{G.p.m.} = C_v\sqrt{(p/G)}$$

STEAM:

$$W = 63C_v\sqrt{(p/V)}$$

GAS:

$$Q = 1360C_v\sqrt{[(pP)/(460 + {}^\circ\text{F.})G]}$$

$$W = 104C_v\sqrt{[(pPG)/(460 + {}^\circ\text{F.})]}$$

where:

C_v = Flow coefficient of valve
d = Valve size in inches
°F. = Inlet gas temperature
G = Specific gravity
G.p.m. = Gallons per minute
P = Inlet pressure in lbs./in.^{2} absolute
p = Pressure drop across valve in lbs./in.^{2} for steam or gas not greater than $P/2$
Q = Cubic feet per hour at 60°F. and 14.7 lbs./in.^{2} absolute
V = Specific volume of inlet steam
W = Pounds per hour

FLOW COEFFICIENT

d	C_v
3/16	1.0
¼	1.6
3/8	2.5
½	4.0
¾	6.3
1	10
1¼	16
1½	25
2	40
2½	63
3	100
4	160
6	360
8	640
10	1000
12	1440

When p, the pressure drop across the valve for steam or gas, becomes less than one-half the inlet absolute pressure P, any reduction in outlet pressure below ½ of the absolute inlet pressure will give no further increase in flow. This is known as critical flow. All compressible fluids follow this law approximately.

If all the liquid flowing conditions are known, and it is desired to determine C_v and a definite valve size, the above liquid formula may be written as follows:

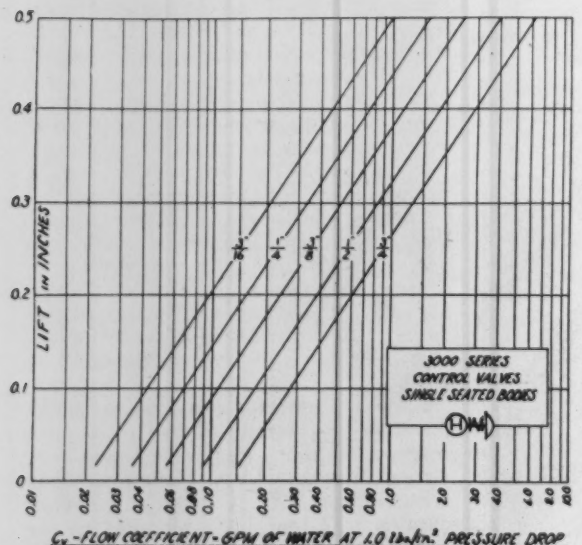
$$C_v = \text{G.p.m.}\sqrt{(G/p)}$$

With gas and steam similarly expressed, when C_v has been determined, it is only necessary to select a valve with a C_v equal to or greater than the calculated value.

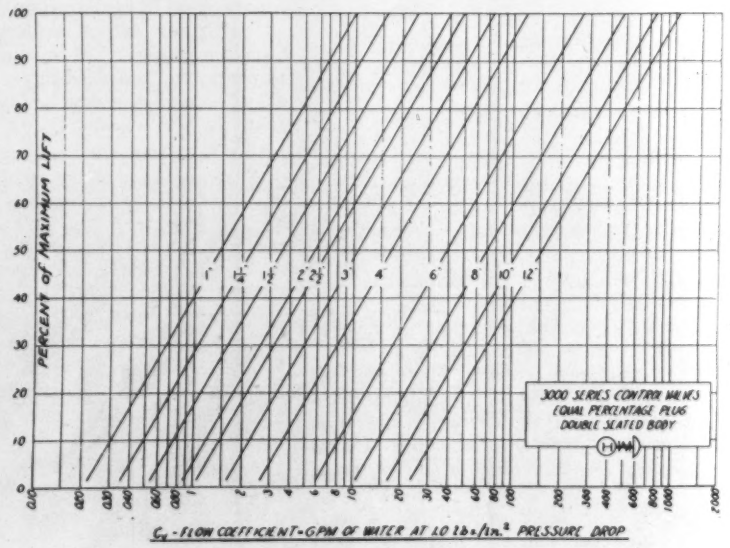
If a definite size valve with a maximum C_v has been selected, and it is of interest to determine valve lift at intermediate or minimum flow rates, it is only necessary to calculate the C_v for these conditions. The actual percentage lift or lift in inches can then be determined by reference to the proper flow curve, shown on Slide 7. For example, a 1" valve has a C_v maximum of 10. Now, if the flow of water is 1 g.p.m. and the pressure drop is 9 lbs./in.^{2}, can the valve handle this condition and, if so, what is the lift? C_v calculated 0.33. By referring to Slide 7, you will see we have 11% lift.

A much simpler, quite accurate, and much more rapid way of determining valve size is to use a capacity chart. Slide 10 gives the capacity of the family of five extremely small plugs used in pilot plant work. These latter carry no line size, as there is nothing to express size. No. 5 plug, for example, has a maximum capacity of 2.3 g.p.m. at 500-lb. pressure.

Slide 11 illustrates flow capacity from a 3/16" valve plug ($C_v = 1.0$) to a 12" valve with a capacity ($C_v = 1440$). The chart is easy to read. For example, let us assume the flow rate of 150 g.p.m. of water at 25-lb. pressure drop. We merely have to follow the 150-lb./in.^{2} line horizontally until it intersects with the vertical 25-lb. pressure drop line. You will note this point is above a 1½" size and below a 2" size. We would,


LIFT IN INCHES
3000 SERIES
CONTROL VALVES
SINGLE SEATED BODIES
C_v - FLOW COEFFICIENT - GPM OF WATER AT 1.0 lbs./in.^{2} PRESSURE DROP

Slide 6


PERCENT OF MAXIMUM LIFT
3000 SERIES CONTROL VALVES
EQUAL PERCENTAGE PLUG
DOUBLE SEATED BODY
C_v - FLOW COEFFICIENT - GPM OF WATER AT 1.0 lbs./in.^{2} PRESSURE DROP

Slide 7

therefore, select a 2″ size valve. Specific gravity correction can be made by using the specific gravity curve shown at either the left- or right-hand side of the chart. By inspection of this chart it is possible to read the capacity of valve sizes up to pressure drops of 800 lbs./in.^{2}. Slide 11 also illustrates engineered design. You will note the valve coefficients: starting at 3/16″, they are 1.0, 1.6, 2.5, 4.0, 6.3, as size increases to ¾″. Starting with the 1″ valve, we have a series similar but ten times larger; namely, 10, 16, 25, 40 and 63 through the 2½″ size. These are ASA Preferred Numbers, each number being 60% greater than the preceding number. Simply stated, a mathematical series of this sort gives uniform steps. This happens to be a 60% series. Such series are used in the design of the capacity of motors, pumps, or refrigerators, so there is a sensible size relationship. You will notice that this series carries on through the 4″ size valve.

My basic philosophy of control valve sizing is that a 1″ valve should have a capacity of 10 g.p.m. or a C_V of 10. Consequently, as pipe size is rational above 1″, you can mentally calculate the C_V for any size valve, merely by squaring the valve size and multiplying by 10. You will note that this calculation is true, except for the 3″ size, where we have taken the "preferred" number of 100, rather than 90. In sizes 6″ and larger, valve body size controls and the preferred number series disappears. Slide 12 shows the flow bench on which the valve characteristic and valve coefficient work was done for small sized valves 3″ and below. Slide 13 illustrates a high-pressure test set for work on pressures up to 800 lbs./in.^{2}.

These formulas and charts give a logical mathematical approach to valve selection or sizing, but there is no substitute for good engineering judgment. There is a tendency to accept the field data given as being accurate and then perform a mechanical mathematical operation. There is also a tendency to concentrate our thinking on the control valve and disregard the characteristic curve of the pump, the piping, heat exchangers or other equipment which may definitely influence the ability of our valve to control flow in the system. Let us evaluate some of these factors.

Two types of pressure drop are usually encountered:

(1) Where the initial and terminal pressure are constant regardless of flow (e.g., make-up of low-pressure exhaust steam from the high-pressure system). This type of application concentrates pressure drop at the control valve; and line friction can be disregarded.

(2) Where the control valve is in series with heat exchangers, piping, and other resistances. These other factors may influence the controllability of the system as much as the control valve does—or even more. Unless the line size is infinite, they will affect the characteristic curve of the system. Qualitatively expressed, the pressure drop available to the valve is low at high flows and high at low flows.

Slide 8

A good general rule of thumb is that at least 50% of the friction drop in the system, exclusive of the valve, should be available as pressure drop across the control valve. In other words, one-third of the total system drop is assumed to be absorbed by the control valve.

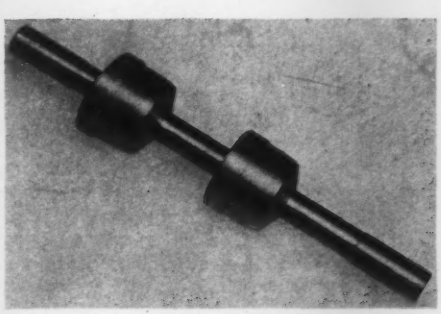
For valves installed in long or high pressure-drop lines, as on cracking heaters, the percentage drop may be reduced to 25% or even 15%. This low pressure drop, of course, arbitrarily limits the possible variation in flow.

In those cases where it is necessary to make an arbitrary choice, 10 to 25 lbs./in.^{2} may be assumed if the valve is in a reasonably short pump discharge line. If the valve works out line size, the piping system is to be suspected, and the calculations determining its size should be reviewed.

The maximum flowing quantity to be handled by the valve should not be greater than twice the normal flow rate. The maximum flow stated for valve size calculations should be based on operating data, if possible.

On all systems in Class 2 above, a reduction in flow rate means an increase in pressure drop across the control valve. If, for example, the maximum flow for the valve is 100 g.p.m. at 9-lb. pressure drop, and the minimum flow for the valve is 10 g.p.m. at 49-lb. pressure drop, the port area charge is 23:1. This is arrived at by the following calculation:

$$\frac{100}{10} \times \frac{\sqrt{49}}{\sqrt{9}} = \frac{70}{3} = \frac{23}{1}.$$



Slide 9

The actual specific gravity of either the liquid or gas is relatively unimportant, around a value of 1.0. An error of 0.1 in specific gravity (for example by using 0.8 when 0.9 is the correct specific gravity) will cause an error of less than 5% in valve capacity. However, this error increases as specific gravity decreases.

No quantitative data are available in relation to the effect of viscosity on valve sizing. When handling extremely viscous fluids, it is the usual practice to make the valve one size larger than calculated. Further research is being carried on at present.

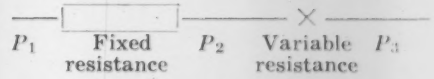
Several methods are in general use for valve selection involving vaporization:

(1) The method of making a separate calculation on the vapor and liquid volume, adding the two figures and supplying a valve with a C_V or area equal to the total figure. This method assumes total vaporization in the valve body and is generally on the large side.

(2) Select a valve one size larger than the C_V calculated on a liquid basis would indicate, and make definitely certain that the downstream piping is adequate in size. The outlet on the control valve should be increased to line size as quickly as possible. This method assumes that vaporization begins in the valve body, but reaches equilibrium at some point in the line downstream from the control valve. This latter method is most economical and generally satisfactory.

(3) The latest method is to make a heat balance.

So far, our discussion has concentrated most of our thinking on the control valve and its characteristics and has considered only in a very sketchy manner the system as a whole. Actually, our method of handling valve selection is analogous to an electrical engineer selecting a rheostat without knowing his complete circuit. Let us assume a single system in which the valve is in series with a fixed resistance which will simulate friction loss in pipe, valves, fittings, exchangers, etc.:



If we know the normal flow rate, fluid and pressures P_1, P_2 and P_3, we can calculate a line coefficient which will parallel the valve coefficient C_V. The line coefficient can be defined as the capacity of the system, exclusive of the control valve in g.p.m. of water at 1 lb./in.^{2}.

The line coefficient C_L and valve coefficient C_V can be combined in the following equation to represent the flow in the system:

$$\text{G.p.m.} = C_V \sqrt{(P_2 - P_3)} = C_L \sqrt{(P_1 - P_2)}$$

$$\text{G.p.m.} = C_V \sqrt{\{(P_1 - P_3)\,[C_L^2/(C_V^2 + C_L^2)]\}}$$

where

G.p.m. = G.p.m. of fluid

C_V = Valve coefficient

C_L = Line coefficient

P_1 = System inlet pressure lbs./in.^{2} absolute

P_3 = System outlet pressure lbs./in.^{2} absolute.

The above equation merely states mathematically that the flow through the valve is equal to the flow through the balance of the system. This equation also assumes that the only variable in the system is the position of the valve plug in the valve body. If we plot the valve coefficient C_V in logarithmic coördinates and valve lift percentage in linear coördinates, we can select values of C_V at various percentages of lift, including C_{Vmax} or 100% lift. What the formula does is to assign mathematically the correct amount of pressure drop to the valve for any selected position of valve lift, permitting accurate calculation of flow for the percentage opening selected. Obviously, in a fluid flow system, what pressure drop is not absorbed by the valve is absorbed by the rest of the system. This is a rigorous approach, in comparison to the common practice of adding calculated pressure drops for the various system components, such as piping, fittings, heat exchange, change in pipe size, etc.

Let us assume some actual operating conditions. We can assume specifically that we have 100 lbs./in.^{2} pressure drop across our system with a normal flow rate of 100 units, which can be, for example, g.p.m. Let us assume that we can maintain the 100-lb. pressure drop under any and all conditions. Let us further assume that, at normal flow rate, the pressure drop across the control valve will be 36 lbs. and across the balance of the system 64 lbs. This ties in with my foregoing suggestion that one-third of the total system drop should be absorbed by the control valve. Let us work out the valve coefficient for a "normal" valve, and further assume that the flow curve is an equal-percentage flow curve with a 4% change in flow for each 1% change in lift, which is roughly equivalent to a valve with a 50-1 rangeability. Let us further assume that the fluid is water, to eliminate the specific gravity factor.

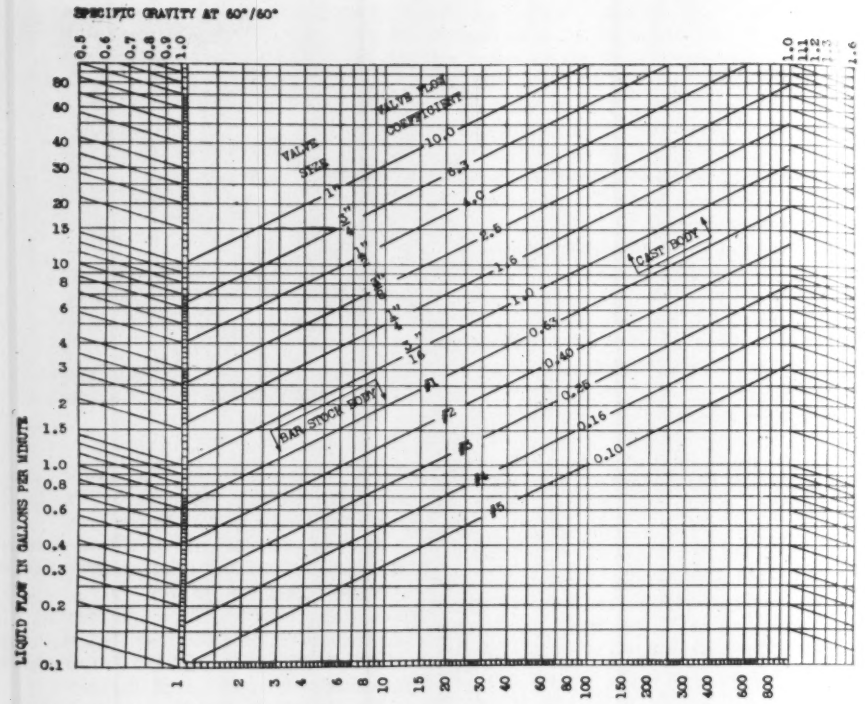
Based on the above information, let us calculate the valve coefficient C_V and the line coefficient C_L.

$$C_V = 100 \text{ g.p.m.}/\sqrt{36} = 16.7$$

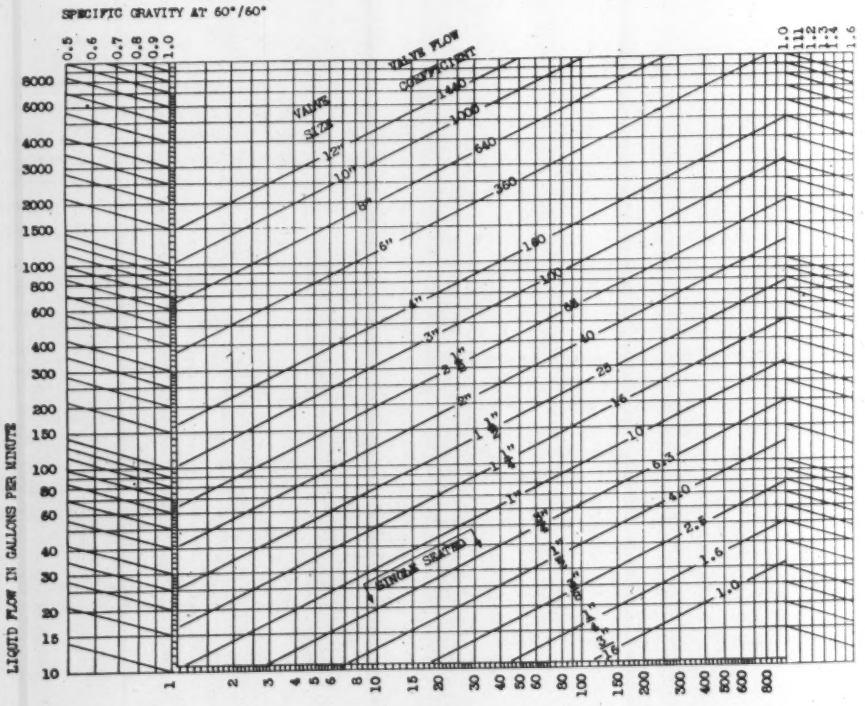
$$C_L = 100/\sqrt{64} = 12.5$$

You will note from the above calculation that the normal valve coefficient calculates 16.7 for this assumed system. If you will recall Slide 7, the C_{Vmax} for a 1¼" valve is 16. Therefore, let us say for this system that the normal valve is practically a 1¼" valve. The line coefficient C_L is 12.5. From "Cameron's Hydraulic Data Book" or other such source, we find that a line coefficient of 12.5 is equivalent to 410 feet of 2" pipe. In addition to seeing what a 1¼" valve will do in series with 410' of 2" pipe, let us install a 1" (0.6 normal), a 1½" (1.6 normal) and a 2" (2.5 normal) valve in the same piping system. What we shall then be doing is to note the effect of valves smaller than line size up to a valve equal to line size in such a pipe system. In addition to these valves, let us include an infinitely small valve and an infinitely large valve.

It had been my original intention to plot a series of curves on semi-log paper, showing the actual flow which would occur at each point in valve lift

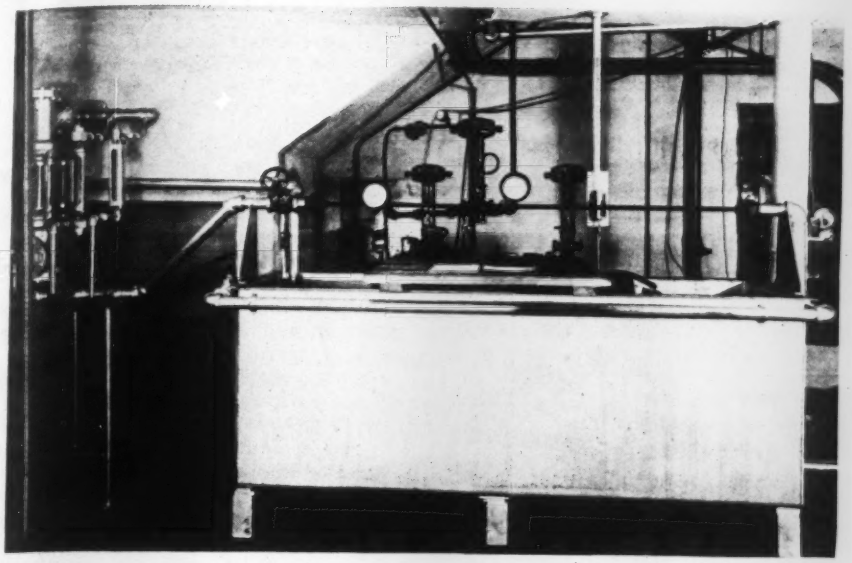

SPECIFIC GRAVITY AT 60°/60°
VALVE FLOW COEFFICIENT
VALVE SIZE
CAST BODY
BAR STOCK BODY
LIQUID FLOW IN GALLONS PER MINUTE
PRESSURE DROP ACROSS VALVE IN POUNDS PER SQUARE INCH

Slide 10

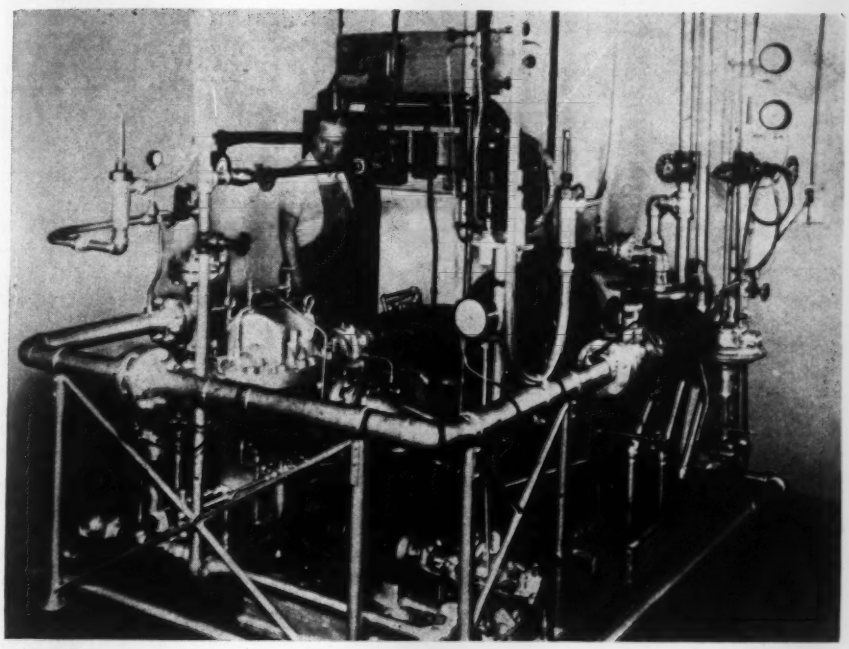

SPECIFIC GRAVITY AT 60°/60°
VALVE FLOW COEFFICIENT
VALVE SIZE
SINGLE SEATED
LIQUID FLOW IN GALLONS PER MINUTE
PRESSURE DROP ACROSS VALVE IN POUNDS PER SQUARE INCH

Slide 11

Liquid flow capacity sizing. The liquid flow capacity chart is based on water as the liquid material. To use the chart for any other liquid, the liquid flow rate must be such that the Reynolds number is greater than 4000, and liquid must not vaporize in the valve. Locate the intersection of the rate of flow in GPM and the Specific Gravity lines. Draw a line parallel to the sloping lines toward the middle of the chart to the Specific Gravity line of one. Continue on the horizontal to the intersection with the pressure drop line. The valve size line passing above this point is the required valve size.



Slide 12



Slide 13

with each of the valve sizes mentioned above in the system proposed. The only thing that would change physically would be the position of the valve plug in relation to the valve seat. I had intended calculating valve lift of 12, 20, 40, 60, 80, 90 and 100% to show the effect of line resistance on valve flow characteristics. As you can readily see, the only variable in such a system is the resistance created by the valve plug. With the method outlined previously, the actual C_V can be determined for any point in valve lift, and the actual system flow at this lift readily calculated. As stated before, the formula accurately proportions pressure drop to the valve and to the line. Therefore, the total flow in the system for any point of valve lift can be easily calculated.

In view of the fact that these curves are not available in slide form, we have calculated the conditions in the assumed system with the valve wide open, or at maximum C_V. This tabulation points out very definitely what happens with valves of various sizes in a given piping system.

Valve Size	C_V	Valve Drop lbs./in.²	C_L	Line Drop lbs./in.²	Flow G.p.m.
Inf. Small	0	100	12.5	0	0
(0.6 N) 1″....	10	61	12.5	39	78
Normal 1¼″..	16	36	12.5	64	100
(1.6 N) 1½″	25	20	12.5	80	112
(2.5 N) 2″....	40	8.8	12.5	91.2	119
Inf. Large.....	....	0	12.5	100	125

Obviously, with an infinitely small valve, pressure drop is concentrated across the control valve; the valve coefficient is zero, the line coefficient is 12.5; as there is no flow in the system, there is no line pressure drop.

The 1″ valve, which is 0.6 normal size, will have our basic valve coefficient of 10. This size valve will take 61 lbs. of the arbitrarily selected 100-lb. system pressure drop. The line coefficient of 12.5, equal to 410′ of pipe, remains constant and will absorb 39 lbs. pressure drop, permitting a maximum flow rate of 78 g.p.m., with the valve plug wide open. In other words, a 1″ valve will permit 78% system capacity.

The normal valve, or 1¼″ size, of course, was the basis on which this particular assumed system was set up and needs no discussion.

The 1.6 normal, or 1½″ valve, has a valve coefficient of 25. As the valve size has been increased, the pressure drop across the valve falls to 20 lbs., the line coefficient remains the same, at 12.5, and the pressure drop absorbed by the line increases to 80 lbs. Inasmuch as we are arbitrarily maintaining 100-lb. drop across this system, the use of a 1½″ valve will permit an increase of flow to a total of 112 g.p.m.

The use of a 2.5 normal, or 2″ valve, which is the same size as the line, gives a valve coefficient of 40. Owing to its increased size, the pressure drop across the valve falls to 8.8 lbs. We, of course, are still using 410′ of pipe, with the same line coefficient of 12.5. In view of the arbitrarily proposed pressure differential of 100 lbs. across the system, the line drop increases to 91.2 lbs.; the maximum flow in the system, using a 2″ valve in series with 2″ line, permits a total flow of 119 g.p.m.

The use of an infinitely large valve with an infinitely large C_V simply means that we have no pressure drop across the valve and are concentrating the entire 100 lbs. across the line. Under these conditions, the maximum flow possible in this system is 125 g.p.m.

What I am trying to say is simply that with a given piping system, it is not economical to attempt to increase system capacity by increasing valve size beyond the normal size. The normal size can be calculated mathematically, if necessary, but is rationally generally several sizes smaller than line size. In increasing the normal valve size to 1.6 times normal, we increase the capacity of the system 12%. By installing a 2.5 times normal valve, or line size valve, we only increase system capacity over the 1.6 times normal valve by an additional 7%, or the net increase over the normal valve of 19%. This table also shows that there is no logic in installing a valve larger than line size, as we only gain an additional 6% capacity by entirely eliminating a pressure drop across the control valve.

While this has been an arbitrarily selected system, pressure drops assigned to the valve smaller than those taken here would permit smaller increases in flow than by increasing valve size.

I believe that the possibilities in this particular subject have just been scratched. We have an extensive research program under way to verify some of the points indicated. If I may, at some future time, I would like to report to you gentlemen what we actually find in the flow test work which is now under way.

A Twelve-equation Computing Instrument*

By CLIFFORD E. BERRY and J. C. PEMBERTON, Consolidated Engineering Corp., Pasadena, Calif.

TWO new instruments which came into increasing use during the war were the mass spectrometer and the infra-red spectrophotometer. Both of these found use in the analysis of complex hydrocarbon mixtures. In this application both instruments created a demand for a third type of instrument, a computer for solving linear simultaneous equations. Since such equations occur in almost every field of engineering and physics, as well as in the applications just mentioned, the computer herein described was developed to meet these needs.

The theory of solving linear simultaneous equations is well-known; the difficulty in practice lies simply in the fact that solving equations by conventional methods requires inordinately long times. For example, using the best available techniques on mechanical calculators, an operator requires at least five hours to solve twelve equations in twelve unknowns. The same problem can be done on the new computer in about 45 minutes and by a less skilled operator.

This saving of time is of considerable importance in the field of hydrocarbon analysis, where the control of a refinery unit may depend upon the results of a mass spectrometer analysis. If an analysis indicates that a change in operating conditions is required, it is obviously desirable to know the results as soon as possible after obtaining the test sample from the unit, in order that the length of time during which the wrong conditions persist be low. Thus more accurate control over the product can be maintained.

Mathematical Principles

In order to understand the operation of the computer it is necessary to understand first the mathematical principles upon which it is based. Consider the set of equations (1):

$$\begin{aligned} 1.0\,x_1 + 0.3\,x_2 &= 0.59 \\ 0.2\,x_1 + 1.0x_2 &= 0.40 \end{aligned} \qquad (1)$$

These are two equations relating the two unknowns, x_1 and x_2. A little pencil work on this simple problem will reveal that the equations are satisfied by

$$x_1 = 0.5$$
$$x_2 = 0.3$$

A set of equations can be written in more general form as follows:

$$\begin{aligned} a_{11}\,x_1 + a_{12}x_2 + a_{13}x_3 &= m_1 \\ a_{21}\,x_1 + a_{22}x_2 + a_{23}x_3 &= m_2 \\ a_{31}\,x_1 + a_{32}x_2 + a_{33}x_3 &= m_3 \end{aligned} \qquad (2)$$

Here the a's represent the known coefficients, the x's the unknowns, and the m's known data. Obviously, any number of equations could be written in a similar manner.

The conventional method of solving such equations is to eliminate one variable at a time until only one is left, then to solve backwards, finding the value of one unknown at a time. Another less known method, however, proves to be more suitable for electrical representation. This is known as the "classical iterative method," which in more familiar terms means a method of systematic successive approximations. In this method, the first equation is solved for the first unknown, assuming arbitrary values for the other unknowns. These arbitrary values may be zero, for example, in which case the first approximation to x_1 is simply m_1/a_{11}.

Using the first approximation to x_1, the second equation is solved for the second unknown, assuming the same arbitrary values for any remaining unknowns as before. The same process is carried through for each equation until a first approximation to each x has been obtained. These first approximations are substituted back into the first equation, and a new approximation to x_1 is obtained. Then new x_2, x_3, etc., are obtained. The process is repeated as many times as necessary until on two successive approximations the x's all remain unchanged to a sufficient degree of approximation. These x's are the correct answers.

Although this process seems clumsy on paper, actually it is extremely rapid in the computer, since each solution for an x requires merely adjusting a voltage-dividing resistor to a null, and all intermediate answers are remembered by the computer as long as they are needed. No numbers need be written down by the operator until the final answers are reached.

Basic Circuits

Referring to equations (1) or (2), it is seen that a computer which is to represent these equations must be capable of adding numbers and multiplying pairs of numbers. In Fig. 1 is shown a circuit which gives a voltage proportional to the sum of a number of voltages. It is easily found by use of Kirchoff's laws that the output voltage of this circuit is strictly proportional to the sum of the various source voltages, assuming that all of the resistors are equal and that the voltage sources have negligibly low impedances. Thus if the source voltages are made proportional to the numbers to be added, the output voltage will be proportional to the sum of those numbers.

To obtain the product of two numbers a simple circuit is used which in one form or another is familiar to most engineers. This is shown in Fig. 2 which shows one voltage-dividing re-

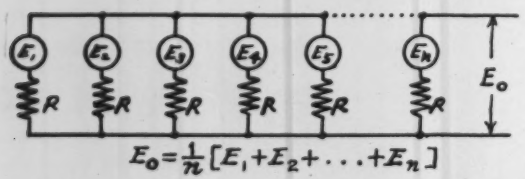


Fig. 1. An electrical network for adding a number of voltages.

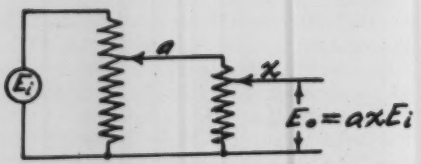


Fig. 2. An electrical circuit for multiplying two numbers.

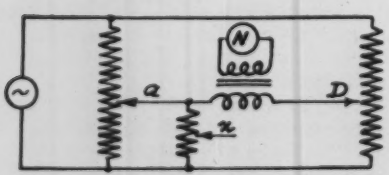


Fig. 3. A Wheatstone bridge circuit for setting a ratio on a loaded potentiometer. D is a standard decade.

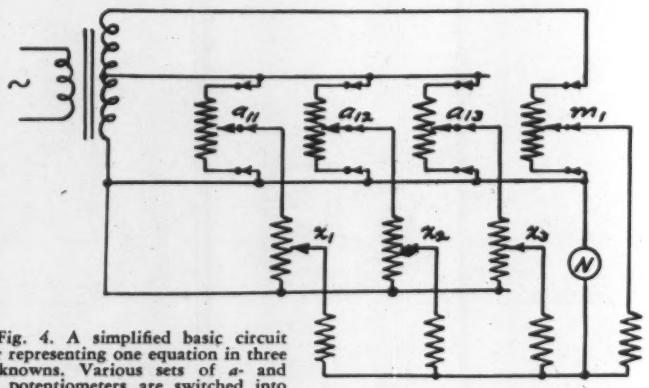


Fig. 4. A simplified basic circuit for representing one equation in three unknowns. Various sets of a- and m- potentiometers are switched into the circuit at the points indicated.

*Presented before the California Section of the Instrument Society of America, Los Angeles, Calif.

sistor (or potentiometer*) supplying voltage to a second potentiometer. The output voltage of this combination is proportional to the product of the two ratios set on the respective potentiometers. However, in setting a ratio on the first potentiometer, which we may call an a-potentiometer, account must be taken of the loading effect of the second potentiometer, which we may call an x-potentiometer.

Fig. 3 shows a circuit for setting values on an a-potentiometer. The output voltage of its arm is compared with the output voltage on the arm of a standard decade potentiometer, and when the a-setting is correct a null indicator reads a zero difference voltage. This is simply a form of Wheatstone bridge. It should be noted that the effect of the loading action of the x-potentiometer is automatically taken care of by leaving it in the circuit while the a-potentiometer is being set.

Using circuits of the two basic types just described for adding and multiplying quantities, it is simple to construct a circuit which will represent one equation; Fig. 4 is such a circuit. In this a number of a-potentiometers are connected in parallel to a source of alternating voltage. Each a-potentiometer multiplies an x-potentiometer, so that between the arm of each x-potentiometer and ground appears one of the ax product terms. All of the ax terms are added together, as required by the equation, by use of an addition circuit, which regards each one of the x-potentiometers as a voltage source. In order for the sum to be accurate it is necessary for the resistance looking into an x-potentiometer to be small compared with the addition resistor; this requirement is not difficult to meet in practice.

The m-term is regarded as a negative quantity, added algebraically to the left-hand side of the equation, and the equation set equal to zero. Electrically this involves providing a potentiometer to represent the m-term, and supplying it with a voltage opposite in phase to that supplied to the a's, as shown in Fig. 4. This potentiometer is treated in the same way as the x-potentiometers for addition.

Such a circuit is of course capable of representing only one equation. Reference to the set of equations (2) will show, however, that the same x's occur in each equation. Thus to represent a number of equations the same set of x-potentiometers and addition resistors can be used, if arrangements are made for switching different sets of a's and m's into the circuit. The appropriate switching points are indicated in Fig. 4.

In operation, the a's, which represent known data, are set on the a-potentiometers. The m's are likewise set on their potentiometers. The first set of a's, corresponding to the first equation, is switched into the circuit, and the first x-potentiometer is adjusted until the null indicator gives a zero reading. The second set of a's is then switched into the circuit in place of the first set. This time the first x is left at its previous value, and the second x is adjusted until the second equation is in balance. This process continues rapidly until all equations are in balance simultaneously. The values on the x-potentiometers then represent the values of the unknowns.

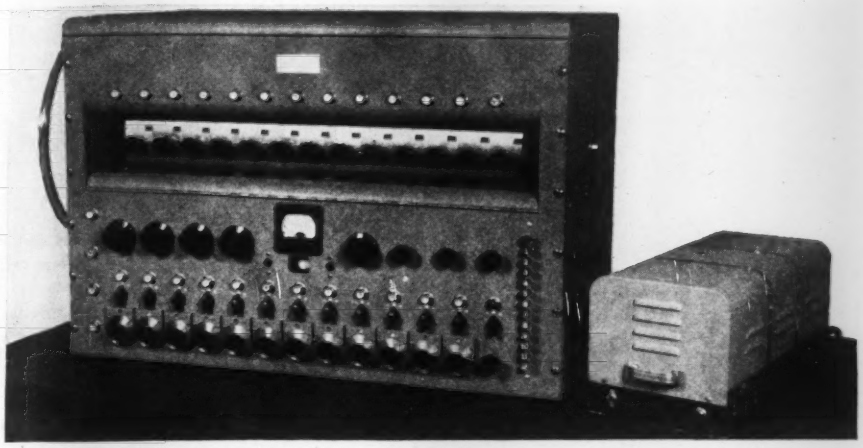


Fig. 5. Front view of computer, showing turret and all controls. The turret is rotated by means of the handwheel to bring into the window any desired row of potentiometers. The bottom row of dials are the "x-potentiometers" which represent the unknowns. The cathode-ray tube null indicator is in the center of the panel, and to the left of it are four dials of the precision decade potentiometer.

Practical Circuit Details

For purposes of discussion, the computer can conveniently be analyzed into a number of elemental parts. In addition to the basic circuits just discussed, there are the following which will be discussed in turn:

A. Selecting circuits

B. Indicating circuits

C. Signal source

D. Null amplifier and indicator

A. In order to set the desired numbers on the a-potentiometers, it is necessary first to set a number on the decade potentiometer, then to select the required a-potentiometer and adjust it to match the decade potentiometer. To select the row in which an a-value is to be set, a turret (shown in Fig. 5) which carries all of the a- and m-potentiometers must be rotated to bring the required row to the window in the cabinet. A selector switch, marked "column selector" on the photograph, then switches any one of the a's in the selected row into the bridge circuit.

A second type of selection must be performed; that is, there must be a selector for setting up the various types of circuits. A switch, called an "operation selector," on the end of the cabinet permits the following to be set up:

(a) Bridge circuit for setting a's (Fig. 3)

(b) Bridge circuit for setting m's—essentially the same as (a)

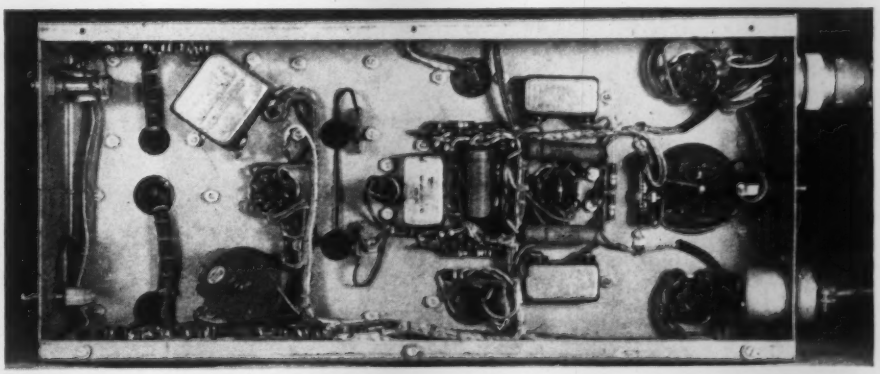


Fig. 6. Under-chassis view of the oscillator and power supply.

(c) Circuit for representing an equation (Fig. 4)

(d) Circuit for reading on decade the values of the x's found in solution.

B. A number of indicator lights are visible on the panel of the instrument in Fig. 5. These are connected with the switching circuits just described so that the potentiometer to be turned in any given operation always is one which has a light above it. The four lights in a vertical column at the left end of the computer indicate the position of the

*Editor's Note.—To save space the incorrect term "potentiometer" has not been changed to "voltage-dividing resistor" in the remainder of this article.—MFB

operation selector. The lights greatly reduce the possibility of making errors by turning the wrong potentiometer.

C. As indicated in Fig. 4, it is necessary to supply the entire circuit with a source of alternating current. Neither the actual value nor the constancy of the voltage supply is important, since the balance condition of a bridge does not depend upon the value of the source voltage. The choice of frequency is determined by several factors. First, the frequency should not be so high that stray capacitance effects are of importance. Second, the frequency should not be so low that special transformers are required. Third, frequencies near 60 cycles or its harmonics should be avoided. Taking all of these factors into consideration, a frequency of 90 cycles was finally chosen.

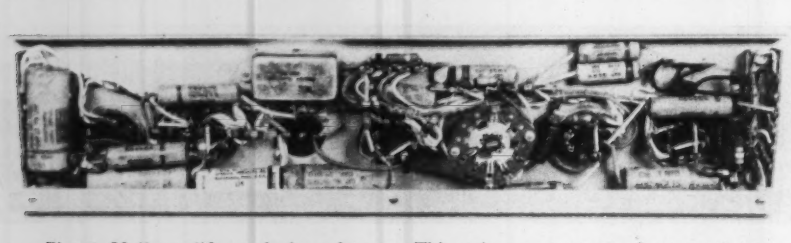


Fig. 7. Null amplifier and phase detector. This unit mounts on the front panel just above the window.

The oscillator is a conventional vacuum-tube circuit which drives a power amplifier capable of supplying 6 watts. This provides a signal voltage of about 20 volts across the a-potentiometers. It should be noted that the turret switching method allows all but one set of a-potentiometer to be out of the circuit at any time, so that only enough power to supply one row is needed. Fig. 6 shows the oscillator and power supply. This unit is not in the main cabinet, but rather in a small external case; the purpose of separation is to eliminate heat producing elements from the main cabinet as much as possible.

D. As in all bridge circuits, some sort of null indicator is necessary for determining the condition of balance for each of the operations. This takes the form of a high-gain tuned amplifier (Fig. 7), the output of which is indicated on a one-inch cathode ray tube. The indicator can be seen in the center of the panel in Fig. 5. A sinusoidal sweep from the signal source is used, so that an unbalance voltage appears as a stationary ellipse which flattens down to a horizontal line at balance. The sensitivity of the system is such that a motion of one wire out of 6000 on one of the helical potentiometers is easily discernible. Likewise, a change of one unit in the fourth decimal place of the decade can be seen.

In using such a sensitive null indicator it is obvious that a short distance on either side of null the amplifier overloads and the operator has no way of knowing in which direction the null lies. A manually-operated sensitivity switch would be one solution to the problem, but this would considerably slow the operation. Likewise a logarithmic amplifier might be made to work, but the operator would still begin turning in the wrong direction half the time on the average. Consequently a "direction indicator" was devised, consisting of a phase-sensitive detector connected to the output of the amplifier. As is well-known, the phase of the unbalance voltage of a bridge reverses in going through null. This principle is used to light either of two neon lamps, which appear at each side of the cathode-ray tube. The lights are so arranged that the operator always turns away from the light to go in the direction of null.

Precision of Components

In order to obtain the degree of accuracy required, considerable attention must be paid to the various components. The decade potentiometer, for instance, is capable of setting numbers from 0.0000 to 0.1000 with an error of ± 0.0001 or less, and numbers from 0.1000 to 1.0000 with an error of less than 0.1% of the value being set.

For all of the a's, x's, and m's, helical potentiometers are used. These permit very fine setting, since they are of the 10-turn variety and contain some 6000 turns of resistance wire. As stated before, the null indicator is capable of showing a difference of one wire so that setting these potentiometers to the nearest wire means a setting error of only one part in 12,000.

The over-all accuracy of the computer depends largely upon the addition resistors. These resistors are padded with small resistors so that their values are within 0.01% of one another. Furthermore, each resistor is shunted by a small trimmer capacitor in order to balance its stray capacitance. These resistors are mounted in a heavy copper box which runs the length of the panel behind the x-potentiometers. Since there is no source of heat near the box, these resistors are at a uniform temperature.

Mechanical Details

The method of mounting the a- and m-potentiometers on a turret greatly reduces the panel size of the instrument and eliminates much wiring. For ease of assembly and servicing, the turret is composed of sections which are shaped like brake drums. Fig. 8 shows one section with the potentiometers in place. Each potentiometer is connected to a set of three switch contacts which engage a corresponding set of contacts mounted on a bar just below the window in the panel.

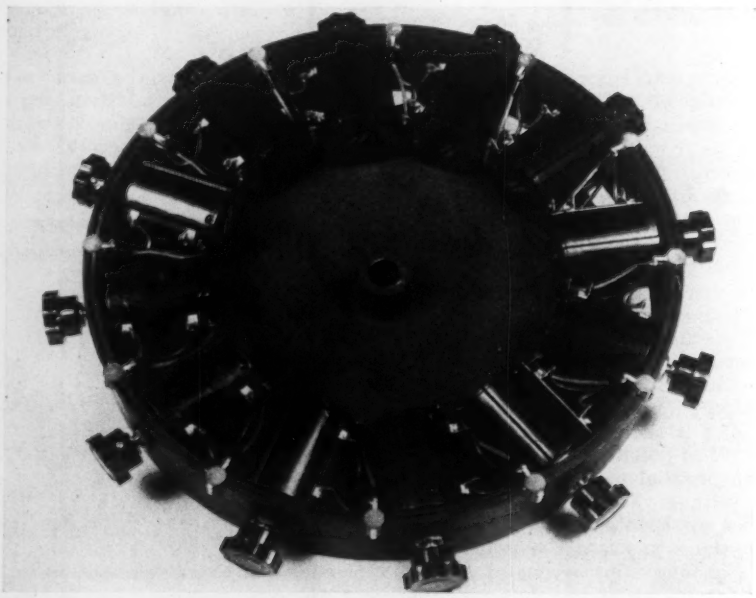


Fig. 8. One section of the turret, showing the method of mounting the helical potentiometers and contacts.

All essential parts and the wiring are carried on the front panel, so that servicing is facilitated. The cabinet is not built around a framework, but is "skin-stressed" for lightness. A single torsional stiffening tube is used between the two ends below the turret in order to prevent misalignment of the turret bearings.

'Tis Only a Pressure Controller, But—

By Q. SQUIGEL

IT doesn't work.

Yancey, the chief operator, calls to tell me it doesn't work. Yes, he calls in person instead of ringing me up on the plant phone—a sure sign of his intense displeasure. He also puts in a few pointed remarks about the instrument sales engineer, the manufacturer, myself and everyone who has anything to do with the job. When he pauses for breath after what seems like an hour of mental torture I try to tell him that it isn't my fault, that all I did was requisition the instrument. But Yancey is in no mood for wasting time on chit-chat. "Chit-chat" is when *I* talk.

The set-up is something like this: There's a column with a reboiler at the bottom, a vapor condenser, a reflux tank and pump. All the stuff goes back as reflux except about 1½% which is bled off the vapor line above the condenser as product, and another 1% of non-condensibles which is taken off the condenser. The object is to control the pressure in the column and condenser by regulating a valve in the non-condensible bleed-off line. It's only incidental that the pressure-temperature relationship at the top of the column is critical. The fact that the reflux tank has a storage capacity of only a few seconds is also unimportant. Then there are variations in the feed and in the water to the condenser, but that's irrelevant.

So I say, "Okay Yancey, I'll see what I can do about it."

Yancey winds up by reminding me of a few gruesome things that could happen to me if something isn't done.

I get in touch with the manufacturer's representative and get his shoulder wet with my tears. He's a nice guy and anyway he has his guarantee to think about. He agrees to send out a service man to fix it up.

The next day the service man calls back. "Everything's okay, chum, I put a positioner on the valve and she's smooth as four-year-old Scotch, drawing a perfect circle."

So that's that, I hope. But it isn't.

The phone rings and when I answer it, it explodes in my ear. Yancey is never in better form. Eloquently he blesses everything from pressure controllers to the UNO.

I say, "How does it act?"

"Act? It doesn't act. The pressure stays at the control point for a few minutes, then the sun goes behind a cloud, a cool breeze comes up and the pressure starts falling. And it don't come back till maybe next Monday."

"Does the valve action follow the controlled air pressure?" I ask.

"How should I know?" Yancey snorts. "All I know is the fouled-up thing don't work and somethin's gotta be done about it."

So I figure things have come to the point where I should take them up with the-guy-in-the-corner-office.

The-guy-in-the-corner-office scratches his head for a moment after I outline the details of my troubles.

"The point is this," he says, "If you expect a final control element to work, it must have hold of a larger percentage of the total flow than the maximum percentage of fluctuation."

While I am thinking that over, he pushes his fist toward me with the point of his pencil sticking out under his thumb. "Take hold of it—the pencil point," he says. I can barely get a hold on it between my thumb and forefinger. Then he pulls the pencil out of my grasp. I look at the guy with some surprise and decide that any of us are liable to crack if we stay at this process-control business long enough.

Then he explains. "The reason you couldn't hold on to the pencil was because you didn't have hold of enough of it. Do you see?"

I nod.

He continues: "The job of this controller is about as difficult as you trying to control the water pressure at the city pumping station by manipulating the valve on your kitchen sink."

He taps his pencil on the desk for a few moments to give my ivory a chance to catch up. Then he says, "If you want to correct that situation, you might try putting another control valve on the water line to the condenser. Let this controller operate both the valve in the non-condensible line and the water valve. That way you have control of the condensing rate of practically the entire flow and therefore you can control the pull which the condenser exerts on the column."

I decide that the-guy-in-the-corner-office hasn't slipped after all. It sounds to me like a good idea. I mull this idea over for a day or two until I have sufficient courage to call Yancey and suggest the change to him.

But Yancey doesn't sound like Yancey when I get him on the phone. He seems to be in good spirits. Anyway I explain to him how the application is probably wrong in the first place. I tell him about the kitchen sink and the pencil, and he says, "You better lay off that dollar-a-pint stuff, Squigel."

I ignore the remark and tell him about the additional valve that we can put on the water line to the condenser.

But Yancey says, "Change my piping again? I should say not. Once I get the plant to running smooth and you want to change it. The answer is no—*no*—NO! Anyway that pressure controller is working fine. We were getting a few slugs of water in the feed, but since we got that straightened out everything is hunkey dunkey."

That's all there is to it. I just thought I'd tell you about it while I cut out these paper dolls. But there are a couple of morals to the story. In the first place, don't pick anything up unless you can get a grip on it. And in the second place, don't always blame the instrument; the joker may be with the jerk who dreamed up the application.

Cartoon by Phil Putnam, member of Philadelphia Section, ISA. "Q. Squigel" is a member of another Section and his identity is known only to your editor.

A Moisture-control System for Aircraft Instruments Containing Vacuum-operated Gyros

By E. R. DYE and R. J. W. KOOPMAN, Cornell Aeronautical Laboratory,* Buffalo, N. Y.

DURING military operations in the CBI Theatre, aircraft flying the "Hump" met with two serious problems in the functioning of vacuum-operated gyro instruments because of the excessively moist air which was drawn into the instruments during the monsoon season. This moisture would condense on the gyro bearings and other delicate parts when they became relatively cool during overnight layovers. However, a more serious problem arose when aircraft were landed through the humid atmosphere of the monsoon season after they had made the trip over the "Hump" at high altitude and all of the instrument parts were cold. Under these conditions a considerable amount of water would be condensed and deposited in the instruments.

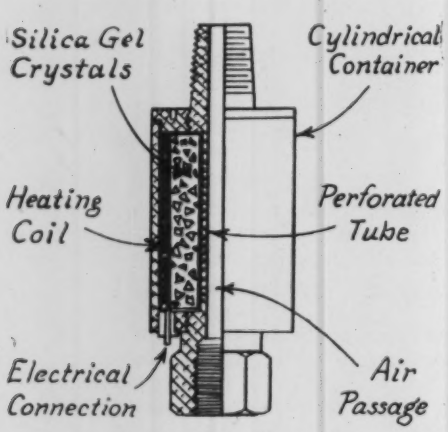


Fig. 1

These problems were referred to the Research Laboratory by Curtiss-Wright field representatives through the Engineering Department.

The first problem was solved by utilizing and improving upon the engine-pickling plug idea. A diagram of a moisture-absorbing capsule using this principle is shown in Fig. 1 and photographs of the assembled device and its components are shown in Figs. 2 and 3. It consists of a perforated tube surrounded by silica gel crystals and the whole surrounded by a heating coil. The porous tube is attached in the air intake line of a vacuum-operated instrument as near to the instrument as practical. When the instrument is not in operation, the capsule removes moisture from the still air in the instrument just as a pickling plug removes moisture from the air in an engine cylinder or crank case. When the system is in operation, the heating coil drives the moisture out of the crystals, thus reconditioning them for another absorbing period. The moisture given off by the crystals when heated passes through the instrument and is exhausted by the vacuum system. This moisture does not harmfully condense in the instrument because the air stream flowing to the instrument is increased in temperature about 15°F. for an air flow of 2 ft.^{3}/min. when the heating coil is connected to a 28.5-volt power source. This added heat in the air stream not only reduces the relative humidity of the air, but warms the instrument and reduces the probability of condensation in it. This warmth is also a factor in the solution of the problem of water condensation on descent from the altitude as will be apparent later.

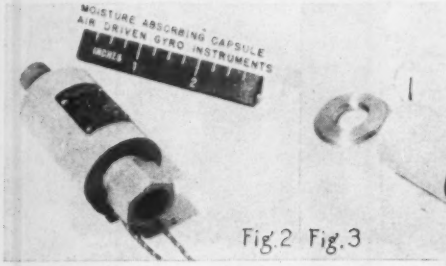


Fig. 2

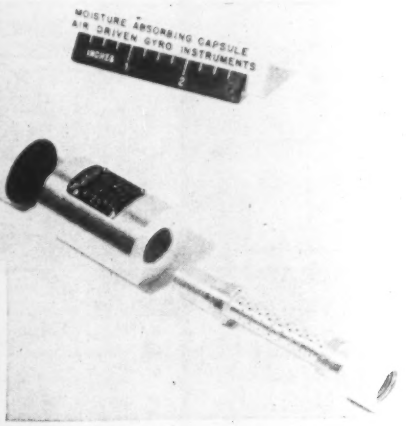


Fig. 3

Another device has been constructed to alleviate water condensation on descent. See Figs. 4, 5 and 6. It consists of a water jacket surrounding a central air passage, a condensed-water reservoir and a ceramic drain plug through which the condensed water can drain when the system is not in operation. The central air passage is connected vertically in the air intake line ahead of the absorbing capsule. Its principle of operation is as follows:

When chilled as it is at the start of a descent from altitude, the water requires more time to rise in temperature than the protected instrument, thus producing a cold spot in the system on which moisture can condense before reaching the protected instrument. In laboratory tests simulating descent from altitude, it was observed that the condenser maintained a temperature differential of 10°F. below that of the instrument. The diameter of the air passage is such that the air velocity in the passage is held low enough to keep from stripping the water droplets condensing on the walls and carrying them into the instrument. A further precaution against such possible action is found in the constriction (see Fig. 4) at the top of the air passage.

Conditions simulating the operation of an instrument on descent from altitude through warm moist air were set up in the laboratory as follows:

A test instrument and the protective devices were set up in a temperature controlled cabinet, the temperature was kept constant at approximately 32°F. until equilibrium was achieved, and then increased at a rate of 2°F. per minute. Throughout the test, rated

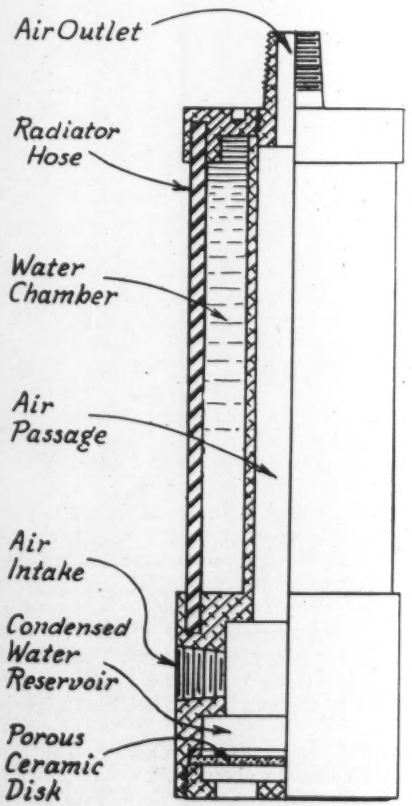


Fig. 4

*Formerly Curtiss-Wright Corporation Airplane Division Research Laboratory.

volume of air was passed through a diffuser placed under water in a heated container and thence into the protective devices and test instrument. Thus the humidity of the air was maintained at approximately 100% and its temperature at 100°F.

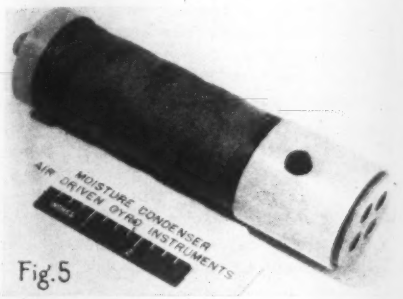
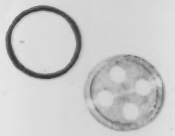


Fig. 5

The devices gave complete protection to a test instrument during simulated descent while similar operation without them caused the test instrument to be covered inside with droplets of water.

Both the absorbing capsule and the condenser have been tested on a transport airplane flying the "Hump" during the past monsoon season. The instruments thus protected on the aircraft came through from 130 to 150 hours of operation in perfect condition, while in the unprotected instruments on the same aircraft the pivots, ball races and balls were badly rusted.

Fig. 6



In one of the simulated descents in the Laboratory the condenser removed 16 grams of water from the humid air. Quantitative measurements were not practical in the field, but it was observed that water dripped from the drain plug of the condenser, indicating that it was operating as designed.

When the electrical supply to the coil in the absorbing capsule is controlled by the ignition switch or other similarly-operated switch, the operation of this protective equipment is completely automatic. Field tests have shown it to be effective and practical. It can be manufactured economically.

A Radio Simulator for Link Trainers

By JAMES R. GRACE, Engineer, United Air Lines, San Francisco, Calif.

WITH the advent of complex modern aircraft radio now carried aboard the commercial airliners, it is necessary to modernize the flight trainers. The Link trainers were formerly used only to instruct pilots in holding and in letdown procedures which utilized the signals from a simulated range station. The increasing use of Automatic Radio Direction Finding (ADF) equipment in orientation, in letdown procedures, and in instrument approach problems, demands that the pilots be trained in the use of this important radio aid.

Simulating the action of aircraft radio equipment becomes almost as complex as the actual radio installation. It is not feasible to have simple mechanical linkages because of the complexity of motions encountered. Movement and direction of the recorder's travel on the chart, the trainer heading, the pilot's course and his track followed, must be so coördinated that the aggregate error is less than one and one-half degrees.

General

A system of simulating the four functions of an ADF receiver was worked out by United Air Lines at San Francisco, and a working model was built in the early part of 1943. Numerous additions and improvements were added at various times. In February, 1944, three complete simulators were manufactured and were installed in the three trainers at Denver, Seattle and San Francisco. One of the Naval Air Stations became interested in duplicating this simulator. United furnished all plans, drawings, etc. to that station. During the course of construction, the Navy incorporated several innovations from which evolved an improved unit requiring less maintenance.

A simulator which incorporates all innovations and improvements gathered by United's San Francisco Radio Shop during their two years research, was built and installed in the Link trainer at San Francisco. This unit has been in use constantly and has proven

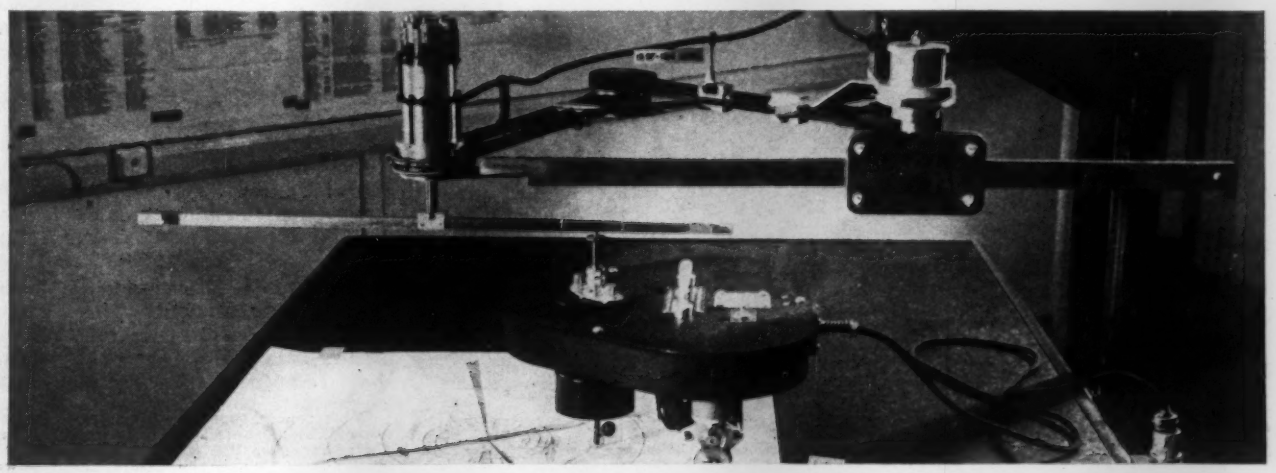


Fig. 1. Desk assembly—channel support mechanism.

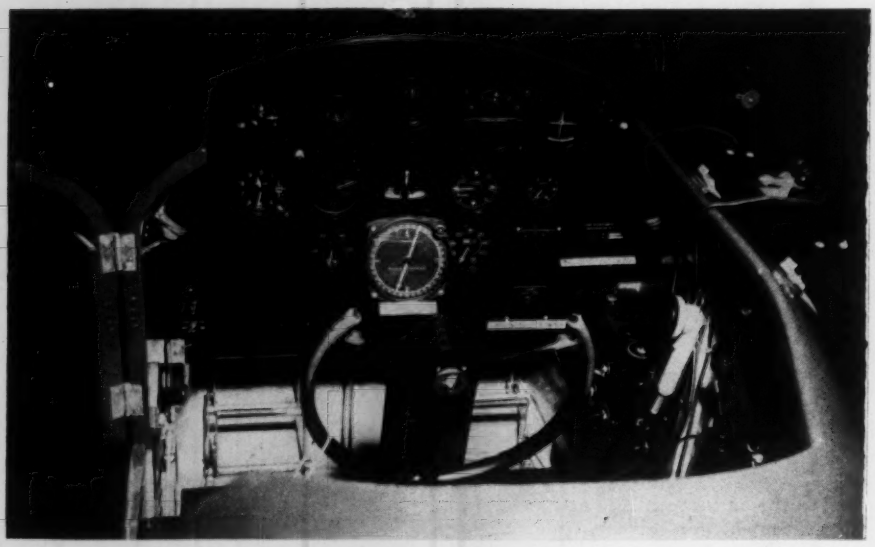


Fig 2. View looking down into cockpit showing the left-right switch, function switch and large azimuth indicator.

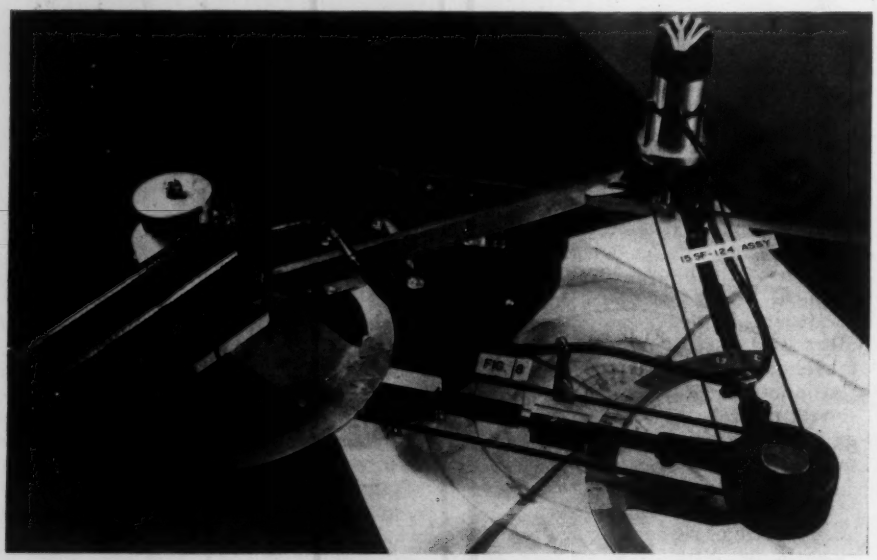


Fig. 3. Desk assembly showing the notched quadrants and wedge block detail.

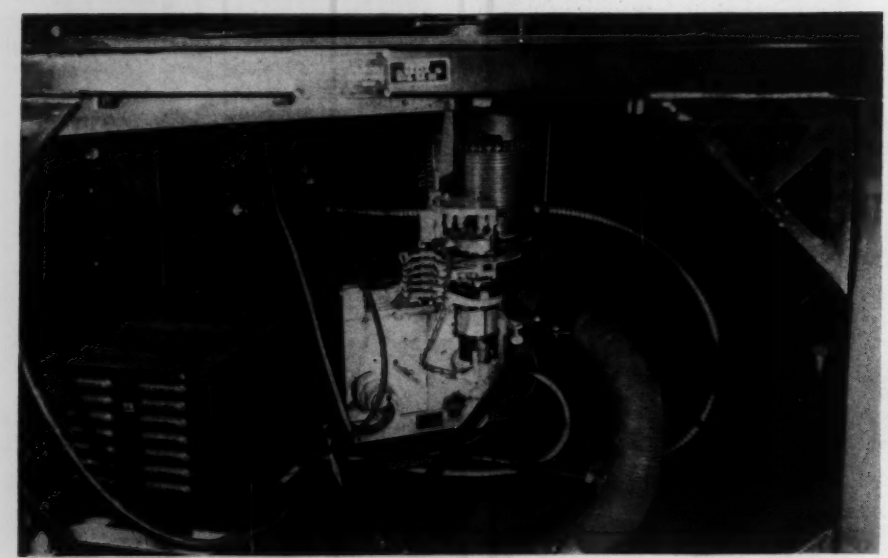


Fig. 4. The base of the trainer proper showing the base teletorque assembly already part of the Link ADF system.

highly successful. United's Engineering Report No. F-40* covers the complete engineering work and constructional details. The following paragraphs describe this simulator.

An ADF receiver when properly tuned to a radio station will indicate the direction of the station by a pointer on the azimuth indicator. The indicated direction toward the station will be accurate regardless of the wind direction or the plane's heading. This seemingly simple function of pointing to the radiofrequency source is accomplished by a specially-designated superheterodyne, a motor-driven loop and a sense antenna. The signal pick-up from the loop and sense antenna combine and feed into the receiver. The phasing of these two radiofrequency signals controls the output of the receiver. The loop position drive motor is controlled by this receiver output, and will rotate the loop until the correct null or zero loop pick-up is obtained. Any loop pick-up will then react in the receiver output to again make the motor drive the loop back into the null position. We have only to provide a remote loop position indicator in the cockpit and simply watch the needle of the azimuth indicator point in the direction of the radiofrequency source. The receiver and control circuits are combined in such a way that the loop does not have 180° ambiguity. The action of an ADF receiver has been duplicated in our simulator.

The radio simulator system consists basically of an azimuth indicator located in the lower center portion of the trainer instrument panel. (See Fig. 2.) A desk unit (Figs. 1 and 3), base unit (Fig. 4), and a fuselage unit (Fig. 5) all react to provide the pilot the azimuth of the station to which he is tuned, and to provide this bearing automatically.

Operation

A 60-cycle Teletorque motor is suspended above the chart on the operator's desk. A U-shaped channel is coupled to its armature and is rotated by a pin mounted on top of the recorder. This Teletorque actuates the cockpit indicator through a differential device consisting of two Teletorques located in the base of the trainer. In this way any movement of the recorder on the chart will give the pilot under the hood a correct bearing on the station. Angular motion of the trainer will also vary the indicator through the differential device so that the pilot's indicated bearing will still be correct.

The Teletorque which is mounted above the recorder is carried on a specially-designed support arm. In simulating the different radio stations it is necessary to place the Teletorque shaft *exactly* over the location of the

*This report runs to 23 pages, 7 diagrams (mostly highly-detailed circuit diagrams) and 9 photographs. We chose only photographic illustrations, hence the discrepancy between their number and the numerals on the photographs.—EDITOR

station on the chart. When moving this channel Teletorque to another station, its stator must not rotate about its longitudinal axis or serious error in the trainer indicator will result. Much thought was given to the design of this support arm as it is necessary for the trainer operator to relocate this Teletorque over another radio station more quickly than a pilot can retune his receiver.

The main component of the arm assembly is a standard 16" drafting machine. The rulers have been replaced by a Teletorque mounted vertically on the head. The steel belts function to prevent any rotation of the stator when the head is moved to any position in a plane parallel to the chart. A pair of quadrants and associated spring-loaded wedges are carried on the drafting-machine arm. By simply moving the Teletorque to a position directly over the radio station, the wedges drop into notches and hold the head over this position until forcibly moved to two notches corresponding to another radio station. (See Fig. 3). A rectangular rod moving freely on six ball bearings supports the Teletorque so that it may be easily moved to any point over the chart. When the Teletorque is moved to a different position over the chart its stator will not be rotated (in much the same way that a drafting arm scale remains parallel to the drawing table regardless of where it is placed).

Another function of an ADF receiver may be simulated by setting the function switch, in the cockpit, to "manual" position. This connects in a fuselage unit (Fig. 5) which consists of 3 Teletorques and one left-right motor. In this position the pilot rotates a simulated loop with a left-right motor until a null is obtained. His indicator then points to either the station or a bearing 180° from the station. This ambiguity is normal when manually rotating any loop. This signal null is obtained by feeding the 1000-cycle audio signal into a Teletorque armature and connecting the phones across one of the field windings. In effect, this gives a rotatable transformer with two sharp distinct null positions exactly 180° apart.

Another novel feature of this circuit is the added amplifier tube placed on the control chassis. When the pilot is flying the null position, he would ordinarily get no interphone. However, by feeding the microphone into a separate electronic amplifier and then directly into the phones, interphone is obtained at all times regardless of the position of the rotatable transformer or cockpit volume control setting.

Another Teletorque indicator with rotatable azimuth is mounted in a box at the operating position and connected in parallel to the pilot's indicator. (See Fig. 6.) In this way the operator can monitor the readings being obtained in the cockpit and if necessary give the pilot off course readings from another Teletorque transmitter also mounted on the desk.

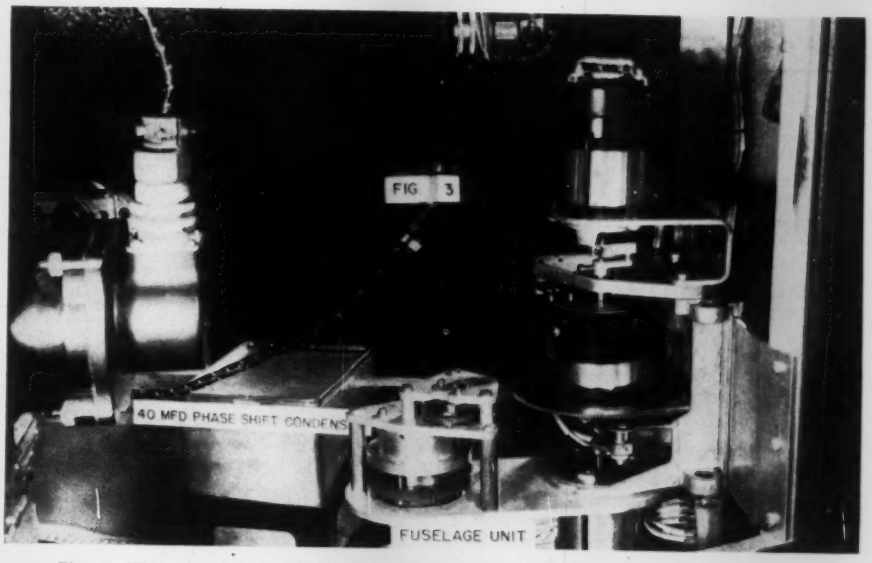


Fig. 5. This view looking in through left rear inspection door of trainer shows clearly the fuselage unit hooked onto its bracket and the phase shift condenser.

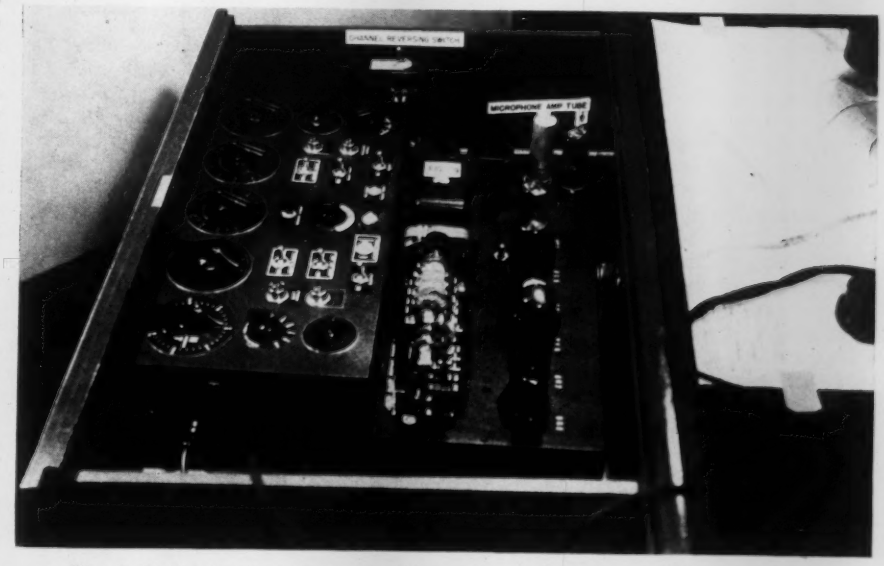


Fig. 6. Radio chassis indicating amplifier tube location and switch for reversing the channel electrically.

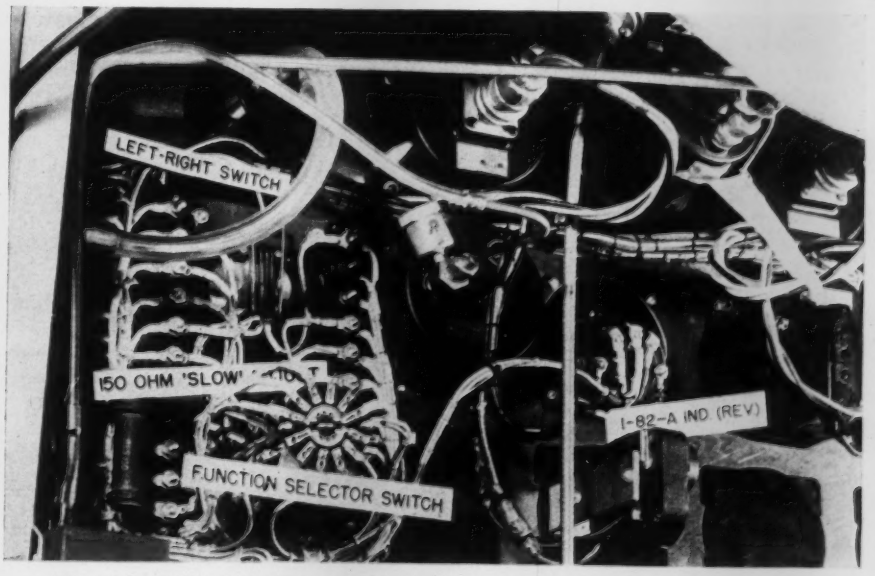


Fig. 7. Rear view of instrument panel showing the new terminal strips on each side of left-right and function switch. Note small teletorque on the 1-82-A indicator.

INSTRUMENTS ON THE MARCH

Complex Instruments Will Measure Atom Bomb's Shock Wave and Blast

[FRONT-COVER PHOTO STORY]

PITTSBURGH, Penna.—Air and water pressure shocks that will follow the explosion of two atomic bombs near Bikini Atoll in July will be measured with intricate equipment built in the Westinghouse Research Laboratories, East Pittsburgh, Pa. Capable of recording pressures far higher than those that occurred a half-mile from the Nagasaki explosion, the devices will be placed on unmanned target ships and will automatically transmit by FM radio their information to receivers on mother ships, Dr. L. W. Chubb, director of the Laboratories, disclosed in announcing the coördination by the Laboratories of all equipment and test procedures of these two phases of the forthcoming atomic bomb naval tests.

In the first test, records will be made of the air pressure exerted on two target ships by explosion of an atomic bomb several hundred feet above the surface. The second test, made during the explosion of the second atomic bomb on the water's surface, will measure the pressure created at six positions around a target ship. Program director is Dr. W. E. Shoupp, manager of the Electronics Department of the Laboratories, who was project coördinator.

Thirty-six pressure pick-ups will transmit air pressure data from eighteen positions on each of two target ships over radio channels. Signals from each pick-up on a radio channel will be examined by an electronic commutator every few millionths of a second and transmitted from each pick-up to two receivers on the mother ship.

For the second (water pressure) test, six tiny tournaline crystals sealed at the ends of rubber cables will send electrical impulses over six separate radio transmitters in a target ship. Because sound travels between three to four times as fast in water as it does in air, the impulses will be that much more rapid and transmitters and receivers must be exceedingly precise. Three cathode-ray tubes will picture the pressure curve on their fluorescent screens.

Changes that occur in a fifty-thousandth of a second are photographed by two very-high-speed cameras, which use up film at the rate of 40 feet per second.

Army's Infrared "Sniperscope" Disclosed

CHICAGO.—The unveiling of the "sniperscope," the Army's infrared telescope for seeing in the dark, reveals another top-secret example of the engineering skill and ingenuity manifested during the war in the Lincolnwood Laboratories of Bell & Howell Co. Designers and product engineers for the complete optical and mechanical unit, for tooling, and for the intricate testing equipment required, the Chicago firm made and assembled this "invisible-light" marvel for the Army's Engineer Board when comparatively few individuals in the country were aware of its nature. The power pack, an ingenious kit slung over the user's shoulder, was made (and wired to the instrument itself) by Electronics Laboratories of Indianapolis, Ind.

Infrared rays long have been recognized and used in photography. An infrared-sensitive film, for example, will record the image of a hot (but not necessarily red-hot) flat-iron in a completely darkened room.

Until the war, however, it had not been possible to omit this photographic process in utilizing infrared radiation. War-time emergency research developed a complex but practical electronic means of converting infrared reflections directly into visible images. Thus, a marksman using a sniperscope mounted on his T-3 carbine can "throw" a beam of invisible light onto his target at night and thereby identify it readily, with obvious results.

The successful operation of the sniperscope (and its companion piece, the "snooperscope," which employs the same infrared telescope with a pistol grip, for searching purposes only) resulted in the designing of an "infrared-sensitive" helmet for use by drivers and passengers in military vehicles during blackouts. Invisible light is afforded by an infrared spotlight mounted on the front of the vehicle.

Ray Nerhus, Bell & Howell project engineer on the sniperscope, reports having worn one of these helmets during a 45-mph. ride in an engineer Corps jeep through some hair-raising terrain one night. "The driver and I," says Nerhus, "had helmets; the boys in the back seat didn't. When we stopped right smack in front of a huge tree (which we could see plainly by infrared light) and then turned on the jeep's regular headlights, the rear-seat occupants all but jumped out of the car!"

With infrared "vision" an accomplished fact, plans already are being made to use the invention advantageously on ocean-going vessels as protection against navigational hazards when visible light is useless.

Infrared Electron Telescopes Revealed

CAMDEN, N. J.—Enemy beaches which were in total darkness to enemy observers were made clearly visible to U. S. Navy personnel during the war by infrared-sensitive electron telescopes developed by scientists and engineers of the Radio Corporation of America, which were used with infrared floodlights and markers. By means of these small, light-weight, infrared viewing devices, the RCA Victor Division revealed as the Navy lifted restrictions on this secretly coded "Nan" equipment, "invisible" landing boats were put ashore on enemy territory, and beachheads were established by "invisible" men.

Heart of the infrared electron telescope is a small image tube, utilizing many television principles, having a

photosensitive surface, but especially sensitive to infrared radiation. Begun as an outgrowth of research on television camera tubes utilizing visible light, and further developed under an NDRC contract, these tubes were ultimately designed as small as 1⅝" in diameter by 4½" long.

Tens of thousands of these tubes were produced at the RCA Tube Dep't plant at Lancaster, Pa., and various types of infrared electron telescopes were manufactured at RCA Victor's Indianapolis plant, according to Meade Brunet, V-P. in charge of the RCA Engineering Products Dep't.

Basic research on the image tubes and other features of the electron telescope, as well as production of initial models, was carried out at the RCA Laboratories, in Princeton, N. J., by Dr. V. K. Zworykin and Dr. G. A. Morton, with the assistance of L. E. Flory, Dr. J. E. Reudy, and G. L. Krieger.

Production design on the image tubes was worked out by Dr. L. B. Headrick, Miss H. C. Moodey, and Dr. E. B. Janes at the Lancaster plant. Production developments and designs for the telescopes were done by R. C. Willman, R. E. Ulrich, L. T. Sachtleben, and R. B. Howard, engineers at the RCA Victor plant in Indianapolis, under the supervision of Stanley W. Cochran.

The same RCA image tubes used in electron telescopes for the Navy were also the basic element of the Army's recently-announced sniperscope and snooperscope, also developed at the RCA Laboratories under the same NDRC contract. The sniperscope was attached to a rifle and served as a gunsight as well as a means of seeing an enemy in darkness. The snooperscope enabled Army personnel to carry out short-range reconnaissance operations under security of complete visual darkness.

In 1935, RCA research experts had developed an infrared telescope which had an excellent image quality, but poor image brightness when judged by present-day standards.

By 1938 they were able to increase the infrared sensitivity from 50 to 100 times that of the original tube. These later electron telescopes could pick up a scene illuminated with a relatively weak infrared spotlight.

The 4½"-long image tube had been developed by 1942, and by the following year was in full production, it was revealed by L. W. Teegarden, Vice President in charge of the RCA Tube Department. On August 25, 1942, the various applications of infrared equipment were tested in a complete amphibious landing operation staged off Solomon's Island, Md. This and other Navy tests established the infrared electron telescope as a practical weapon of war. As sensitivity was improved, RCA tube experts and optical physicists perfected complete portable units consisting of a small spotlight and a hand-borne infrared telescope.

Operation of the RCA infrared electron telescope is not difficult to comprehend. Basically, the telescope consists of an objective lens for forming upon the sensitive cathode of the tube an infrared image of the scene being viewed, the tube itself, and eyepiece. The tube consists of a semi-transparent photosensitive cathode which is ultrasensitive to infrared radiation, an electrostatic electron lens system, and a fluorescent screen. The light-gathering objective lens system concentrates the received infrared image on the photo-cathode, releasing from the latter a pattern of electrons which conforms to the original image. An electron optical system, consisting of an electrostatic field, focuses the electron coming from the photocathode and accelerates them toward the fluorescent viewing screen where a visible reproduction of the original image is formed. The reproduced image is then viewed through a telescopic eyepiece, in the same way in which an ordinary telescope is used.

To actuate the electron image tube, a high-voltage electric power supply is necessary. Obtaining the required high voltage from a small light-weight unit powered by two ordinary flashlight cells presented special design problems. RCA engineers developed a rectified power supply using a tube, vibrator, and a transformer, which gave such excellent results that they found wide usage of this power pack in other applications as well.

Resonant-cavity Oscillators and Their Role in Radar

EAST PITTSBURGH, Penna. — Heart of a radar set is the device for generating super-high frequencies — from a few hundred million to a few thousand million cycles per second. In connection with the generation of megacycle power, two new names have joined the technical man's language— the resonant magnetron and the klystron. The basic concept of the magnetron was born in England; the klystron notion was conceived by two men working at Stanford University. To each device, Westinghouse contributed by making numerous improvements in construction and by designing for high-qauntity production.

The magnetron is the megacycle power generator, and hence is the tube commonly used in radar transmitting sets where large power outputs are desired. The magnetron at the war's beginning had the relatively weak peak output of a few kilowatts. The redesigned magnetrons can deliver up to a thousand kilowatts during the microsecond pulses.

In the magnetron, electrons are emitted from a cathode in the center of an evacuated chamber placed in the field of a strong magnet. The electrons are forced into spiral paths toward smaller, narrow-neck resonant cavities around the central chamber. When the electrons move through the electric field extending into the central chamber from the resonant cavities in the direction such that their velocity is reduced by the electric field, high-frequency power is generated in the cavities, which can be delivered to a transmission line.

Although the magnetron is a high-peak-power device, its frequency cannot be readily varied over a broad band once it has been assembled. The klystron is a high-frequency tube more easily tunable over a broad band although less peak power can be obtained from it. Electrons from a cathode are hurled through a cavity toward a reflector. A high-frequency oscillation has been established across the cavity. Hence, at one instant, the electrons are hastened in their flight by the electric field; the electrons arriving in the cavity an instant later find themselves in an electric field of reversed polarity and hence are retarded. After the electrons leave the cavity they move towards the reflector, which has a negative voltage. Before they reach the reflector they are turned back to the cavity by the reflector. In traveling towards the reflector and back to the cavity, the variation in velocity produced in the cavity results in a high-frequency electronic current, which delivers ultra-high-frequency power to the cavity.

Klystrons until recently have been able to handle maximum peak currents of the order of 50 milliamperes at 1000 volts, or about 50 watts. At an efficiency of only about 1%, this represents only one-half watt of high-frequency power. This limits the klystron to use in radar receivers where large power output is unnecessary.

It has been conventional practice in some klystrons not to permit the bunched electrons to strike the reflector. Westinghouse electronic engineers wondered what would be the effect on the power output of allowing the bunched electrons to strike a reflector coated with a secondary emitter. They took a standard reflex klystron and provided it with such a reflector. They then found that because the bunched electrons striking the reflector (primary electrons) knock from it many more bunched electrons (secondary electrons), this multiplication effect of deliver much more power, because of the high current. Furthermore, the efficiency has been about tripled. The secondary-emission klystron can absorb currents of 200 milliamperes at 2000 volts, which, at 3% efficiency, is 12 watts of usable power. This is about 24 times as much megacycle power obtainable from essentially the same tube but with a new anode. With this high-power output, klystrons which have the advantage of being readily tuned can be used as megacycle generators in low-power radar transmitters.

Scientific Glass Blowing and Laboratory Techniques

By WILLIAM E. BARR and VICTOR J. ANHORN, Gulf Research & Development Company

VIII. GLASS-TO-METAL SEALS *(Continued)*

Copper

The methods in sealing copper to glass were developed by William G. Housekeeper.[4] These glass-to-copper seals are unique because the coefficient of expansion of the glass can be considerably different from that of copper. This metal has a temperature coefficient of expansion of 162×10^{-7} per degree C., and under certain conditions it can be sealed to Pyrex which has a coefficient of expansion of 32×10^{-7}. A large surface of contact is provided between the glass and copper and the latter is so proportioned in the seal that the stresses resulting from the different coefficients of expansion are less than the ultimate strength of the joint between the glass and copper.

Four types of seals will be described.

1. Copper wire can be sealed into glass if it is flattened so that the portion which is sealed to the glass is not over 0.002″ thick. This flattened wire should be sealed by the pinch press method, but without using the preliminary thin-sleeve beading procedure because of the danger of over-oxidizing the wire. The glass of the press is first shaped by drawing down and collapsing a tube to form a shoulder and a section of tubing with a smaller diameter. The wall thickness of the shoulder and small tube should be the same as that of the original tube. The tube with the smaller diameter is cut with the burner flame. A section ½″ from the shoulder is adequate for the press seal. This short section is heated and pressed together until the opening in the pressed glass is just large enough for the flattened wire. The clean flattened wire is pre-oxidized by heating to red heat for several seconds; then it is cooled, dipped into a solution of borax and water, dried in the flame or a furnace and laid into the open press. One end of the wire should be clamped into a pin vise so that it can be held in place. The glass is then fused and pressed together to give a good seal between the glass and metal. The finished seal is illustrated in Fig. 83A. It should be noted that the seal is made on the flattened portion of the wire. The assembly is carefully annealed. The borating step is helpful in preventing over-oxidation of the copper. Vacuum-tight seals have been made without borating the copper surface, but whenever the copper comes in contact with the burner flame during the sealing operation, it has been advantageous to prevent over-oxidation by covering the copper surface with borax.

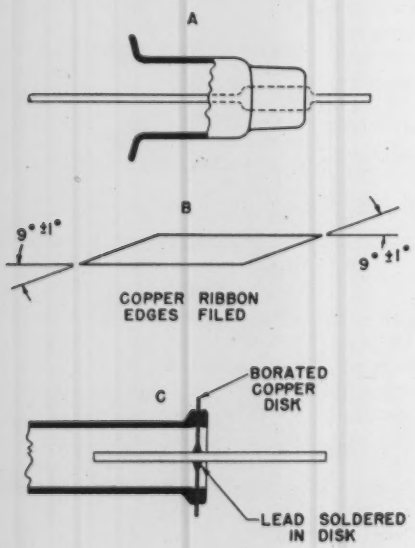


Fig. 83

2. Copper ribbon seals are made by a procedure similar to that of sealing wire to glass (in reality the flattened copper wire is a ribbon section). Copper ribbons up to 25 mm. wide and 0.015″ thick have been sealed into Corning glass 008. The ribbon seal, however, requires one additional operation which was not necessary in the wire seal. The edges of the ribbon should be filed until the two sides have angles of 9° ±1°. A cross-sectional view of the ribbon is given in Fig. 83B. This ribbon is heated to a red heat for about three seconds, borated and sealed into a prepared press.

3. Flat disks of 28 gage copper can be sealed to glass if the glass does not extend around the edge of the disk. An example of a disk seal is given in Fig. 83C. The disk is cleaned, pre-oxidized by heating for three seconds and borated. The ends of two tubes are then fused to the copper assembly is rotated in the burner flame. If only one tube is disk by holding the latter between the two tubes while the sealed to one side of the disk, it is advisable to seal a band of glass around the other. The glass on either side should not be sealed over the edge of the disk. The assembly is annealed when the seals are completed.

Vacuum-tight disk seals are quite useful if considerable current flows through the seal. Heavy copper rods which are capable of carrying currents up to 100 amperes can be brazed through the disk before the seal is made.

4. The glass-to-copper tube seal is frequently used in the laboratory. It can be used in place of a graded seal because Pyrex can be sealed to one end and soft glass to the other. The tube of Fig. 84C is a seal of glass 772 to copper to soft glass.

The glass-to-copper tube seal may be made as an external seal where the glass is sealed to the outside of the tube, Fig. 85A. In an internal seal the glass is sealed to the inside of the tube. The most successful seal is a combination of the internal and external as illustrated in Figs. 85E and 85F. All seals are made on the copper tube which has been machined to a thin or commonly-called "feather" edge. The procedure for making an internal-external seal is as follows:

1. The copper tube is machined at the end to a thin edge. It is then mounted in a glass holder. The thin edge of the copper is heated red hot in a gas-air flame and a glass tube which fits snugly over the edge is pushed over the hot end. The copper should not be allowed to cool because the copper oxide will flake. The glass is then fused to the copper without occluding air. The flame should be kept away from the metal during this operation. When the seal is finished the glass tube is cut in the burner flame about 3/16″ from the end of the copper tube as indicated by the dotted line in Fig. 85A. After the glass tube is cut, the end should appear as shown in Fig. 85B. The glass is then heated and tooled down (Fig. 85C) with a flat carbon tool. It is then tooled into the tube with a round carbon tool. The finished glass covered end should appear as illustrated in Fig. 85D. A second glass tube is then sealed to the glass covered end by the procedure outlined for butt sealing, Fig. 85E. If the tube is machined at both ends, the seals illustrated in Fig. 85F can be made. This assembly can be used for sealing Pyrex to lead glass equipment. The two different glasses can be identified by the color of the glass-to-copper seal: with lead glass, the glass-to-copper is red at the interface of metal and glass; with Pyrex it is yellow. A Pyrex-to-copper cup seal is shown in Fig. 82D. The glass-to-copper tube seals are not limited to small sizes. Many good seals have been made on copper tubing up to 6″ in diameter.

Heavy copper conductors in glass-enclosed bulbs capable of withstanding thermal shock have been quite useful for

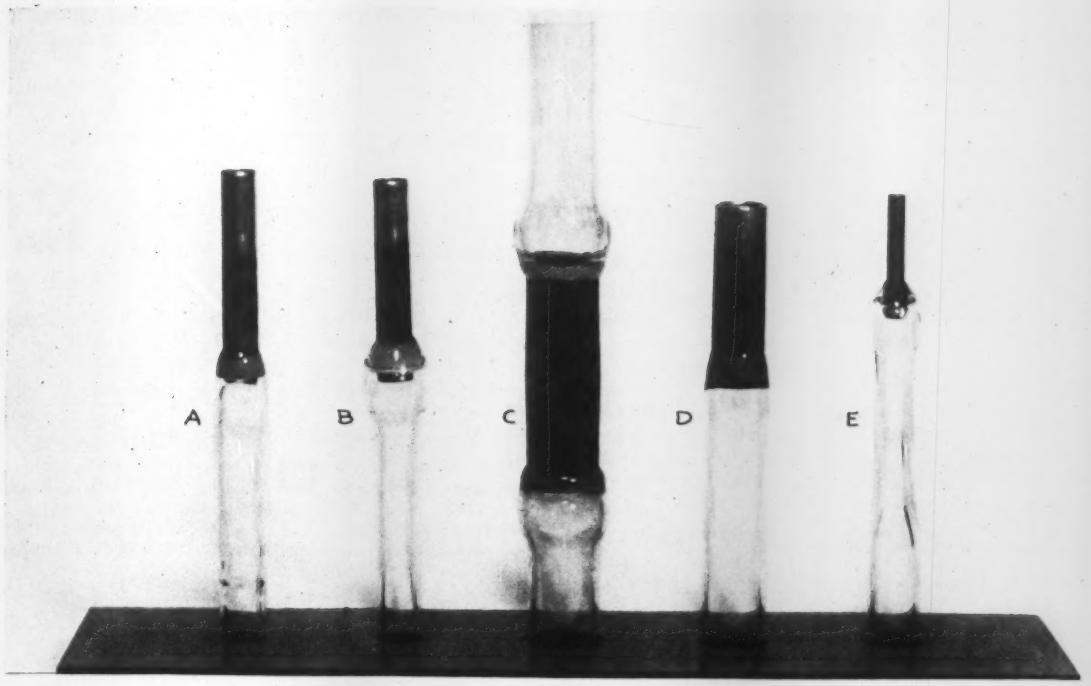


Fig. 84

the construction of ultra-high-frequency transmitting tubes. Examples of sealing a copper rod assembly to glass are illustrated in Fig. 86. The copper rod may be brazed or welded to the part which is sealed to the glass sleeve, Fig. 86A, assembled in a pressed fit, Fig. 86B, or by machined screw threads as illustrated in Fig. 86C. The glass-to-copper seal is made as follows:

1. The copper is machined to a thin or feather edge.
2. A glass tube with an outside diameter which fits snugly into the tube is flared as illustrated in Fig. 86E.
3. The copper rod is then mounted on a suitable holder and the thin edge is oxidized by heating it red hot. This is done by rotating the copper in a cross fire.
4. The flared glass is then pushed into the hot opening and the inside and outside are tooled as it is fused against the copper, Fig. 86F.

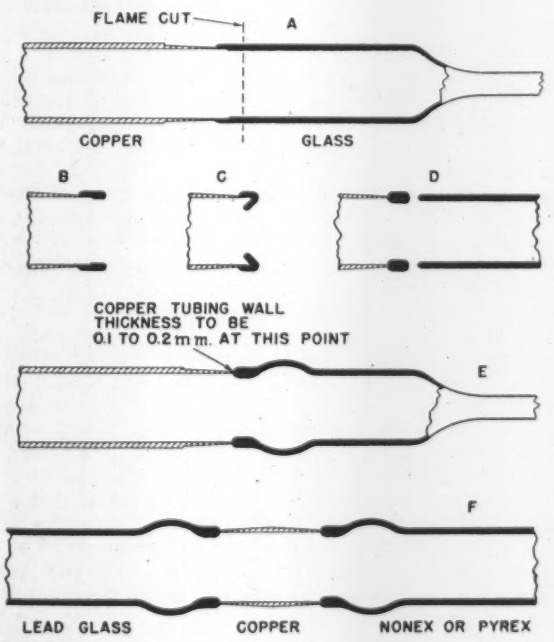


Fig. 85

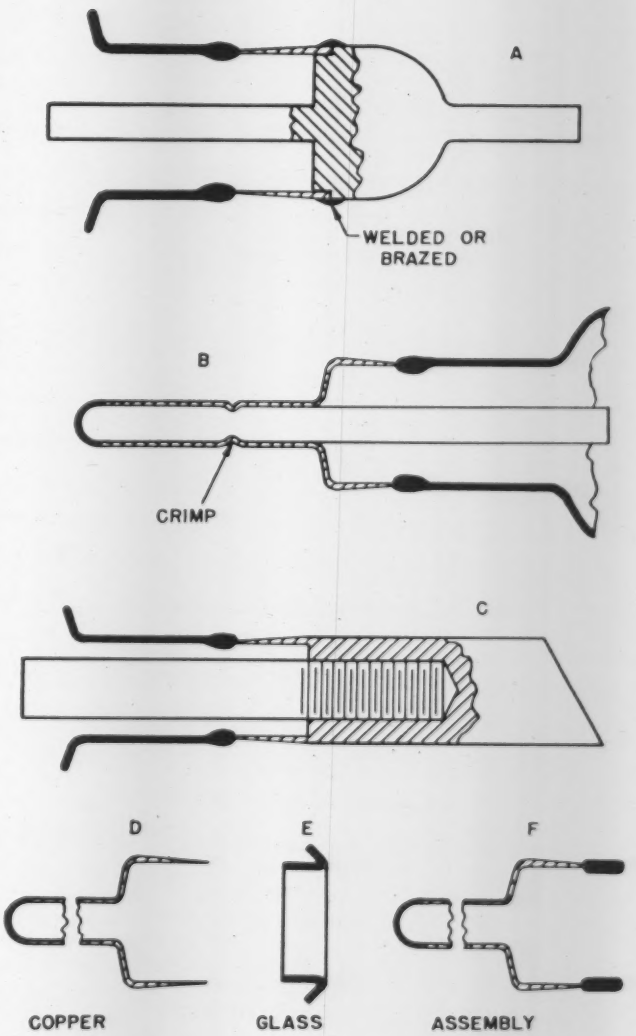


Fig. 86

5. When the glass-to-copper seal is complete, the glass is sealed to the remainder of glass tube assembly. The seals are then carefully annealed.

The glass-to-copper tube seal is mechanically weak because the copper must be thin enough to keep the stress on the glass within safe limits. The copper near the glass seal must never be overheated because it will oxidize to a degree where it will be porous. The mechanical strength of the thin copper is also decreased still further under such treatment. If glass-to-copper tube seals are subjected to thermal cycles (heating and cooling) the thin copper may fail because it is being continually work-hardened. Copper seals cannot be used with mercury because the latter will amalgamate with copper. However, copper can be electroplated with a suitable metal after the seal is completed. The tube in Fig. 82E was nickel-plated after the seal was made.

Machining a copper tube end to a thin edge is sometimes quite difficult unless a metal backing is used to reinforce the tube. A tight-fitting plug can be made which fits into the tube. An alloy, Cerrobend,[10] is also useful for reinforcing a copper tube. This eutectic alloy has a melting point of

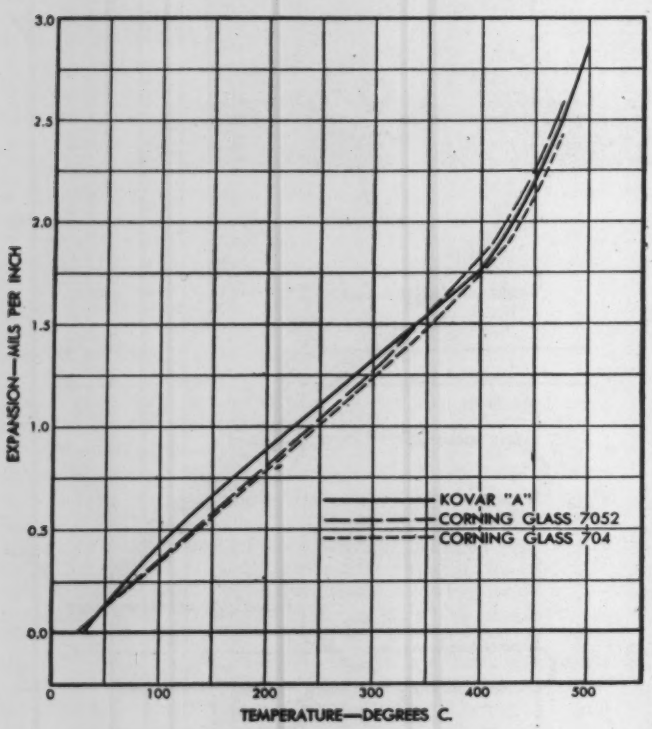


Fig. 87

160°F. and does not adhere to the copper. It is melted and poured into the tube which is machined after the alloy has hardened. After the machining is complete, the alloy is removed by melting.

Dumet

Dumet as described by B. E. Eldred[2] is made by coating a billet of nickel steel with copper and drawing the coated billet to a wire. The nickel-steel core of the finished wire contains 38% nickel and about 20% to 25% by weight of copper. This wire is still used extensively in lamps and vacuum tubes.

The temperature coefficients of expansion of Dumet are approximately as follows:

Radial, 80-100 × 10⁻⁷ per °C.
Axial, 61-65 × 10⁻⁷ per °C.

From these coefficients of expansion it can be seen from Table 11 that the seal will be badly strained when G-5 glass is used. Seals with this glass have been successful because the low yield point of copper sets a limit to the stress exerted. The wire, 1 mm. or less in diameter, is satisfactory for glass-to-Dumet seals. Lead glass, G-5, can be used for beading this wire. It is beaded by the same procedure outlined for making glass-to-metal seals with platinum. Since Dumet is comparatively expensive, it is only used in lengths necessary for the glass-to-Dumet seal. Lead wires of nickel and copper are butt welded to the two ends of the Dumet wire for the press welds.

Kovar

Kovar, a nickel-cobalt-iron alloy, was developed and perfected by the Westinghouse Electric Corporation. It, and the alloy Fernico which is used by the General Electric Company, have a specific temperature coefficient of expansion which is nearly the same as some of the standard glasses. A comparison of the thermal expansion of Kovar with Corning glasses 7052 and 704 is shown in Fig. 87. The specific properties of Kovar are given in Table 14.

TABLE 14. SPECIFIC PROPERTIES OF KOVAR

Composition	29% nickel, 17% cobalt, 0.3% manganese, 52% iron
Melting Point	Approximately 1450°C.
Density	0.302 lbs. per cubic inch
Hardness, Annealed	760°C. 140 to 160 B.H.N.
Hardness, Unannealed	200-250 B.H.N., depending on degree of cold work.
Electrical Resistivity	49 Microhms (cm.²)/(cm.)
Thermal Conductivity	0.046 calories/(cm.)(sec.)(°C.)

Since Kovar has thermal expansion properties which are very close to those of several standard glasses, the alloy need not be machined to feather edges as previously described for copper. This alloy can readily be machined for glass-to-Kovar seals. The sealing surfaces should be free from marks or scratches which extend across the sealing surface. (Other marks are not objectionable.) Glass should not be sealed to surfaces of Kovar parts which have sharp corners; the edges should be rounded with forming tools.

Kovar sealing surfaces must be thoroughly clean and free from gas or gas-forming components. If the surface is not degassed before sealing to glass, gas bubbles will form at the glass-metal interface as the seal is made. These bubbles will impair the mechanical strength of the seal. Kovar is degassed by heating it in a furnace to a temperature of 1050°C. for a period of 20 minutes. Hydrogen which is bubbled through a water trap is fed into the furnace to maintain a hydrogen atmosphere. The metal is moved to a cooling section of the furnace and cooled to 300°C. before it is removed from the furnace. Degassed Kovar should not be touched with the hands—especially the surfaces which are to be used for the glass seal. Glass-to-Kovar seals should preferably be made within three hours after the alloy is degassed.

Kovar must be oxidized before glass can be sealed to it. This alloy may be oxidized during the sealing operation by heating it to about 650°C. in the oxidizing portion of the burner flame, or, it may be pre-oxidized in a furnace. The degree of oxidation for good seals is difficult to determine and a procedure of obtaining a suitable state of oxidation is best gained by experience. Heavily oxidized Kovar yields mechanically strong seals, but these seals are not vacuum-tight. Under-oxidized Kovar yields hermetic seals which are mechanically weak.

If the Kovar is oxidized in the burner flame, 7052 glass is sealed to the alloy while the temperature of the alloy is still between 650 and 800°C. The glass is fused and attached to the metal. If the seal is small, the glass and Kovar, which is suitably mounted, can be worked by hand. Larger seals are best made by using a glass blower's lathe. A new procedure of applying glass to Kovar has been developed by engineers of the Westinghouse Lamp Division.[12] The oxidized Kovar surface which is to serve as glass-to-Kovar seal is covered with powdered glass by suspending the latter in a suitable solvent and spraying the mixture on the Kovar. The metal and glass are then placed in a furnace and heated until the powdered glass is fused to smooth film on the Kovar. Glass can then be sealed to the glass on the Kovar by the simple procedure of fusing glass-to-glass. The glass-to-Kovar seal is not affected by the second sealing operation.

Annealing Glass-To-Kovar Seals

When glasses 704 or 7052 are used with Kovar, seals can be obtained which are nearly stress-free by the annealing technique previously described for annealing glass-to-glass seals. The seal is heated to dull red heat in the annealing burner and covered with a deposit of carbon by turning down the air supply to the air-gas annealing burner.

Furnace annealing is accomplished by heating the seal to 484°C. and maintaining this temperature for twenty minutes. The temperature is then lowered 1°C. per minute to 450°C.; and then about seven to ten degrees per minute to room temperature.*

The oxide on Kovar surface must be removed after the glass-to-Kovar seal is made if the alloy is to be soldered, welded or brazed. A solution of 10% HCl and 10% HNO_3 in water, heated to 71°C. (or 160°F.) can be used for cleaning the oxidized surface. The Kovar is immersed in this solution for five minutes, washed thoroughly with water and dried.

Kovar can be welded with an electric arc. The electrodes should be of the fluxed cooled type and of "18-8" stainless steel (with 18% chromium and 8% nickel). When welds are made on Kovar which has glass seals, one should remember that the metal will conduct heat more rapidly than the glass. The alloy, between the glass seal and the position which is to be welded, must be cooled to prevent heat from flowing too rapidly to the glass seal. The glass and Kovar can also be heated to prevent uneven heating during the welding operation.

Kovar is copper-brazed by using pure copper on the clean alloy surface. A small piece of copper is placed on the alloy surface and the two are placed into a hydrogen-atmosphere furnace. The Kovar is heated from room temperature to 1100°C. in one hour* and this temperature is maintained for 15 minutes. The hydrogen performs as a flux.

Kovar can be obtained in rods, wire, tubing, sheet or special forms, such as cups, flanged cups and flanged eyelets.

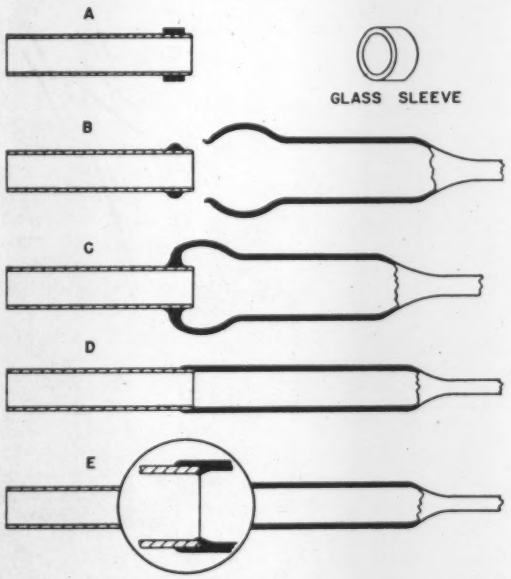


Fig. 88

Stupakoff Ceramic & Mfg. Co., Latrobe, Pennsylvania, is the distributor of this alloy.

Procedure for Making Glass-to-Kovar Seals

As an example of making a glass-to-Kovar seal, a description of the procedure for sealing glass to a Kovar tube will be described.

1. A band of Corning glass 7052, 6 mm. in length, is cut from the glass tube which has a diameter just large enough so that the small section can be slipped over the Kovar tube, Fig. 88A.

2. A point is drawn on a tube of Corning glass 7052. The tube should have the same diameter as that of the glass band, or it can be drawn down from a larger tube and cut open in the burner flame. The end must also be expanded to a bulb and opened if a small tube is used.

3. A short section of Kovar tubing, which has been degassed under conditions previously described, is mounted on a glass holder with asbestos tape. The sealing surface

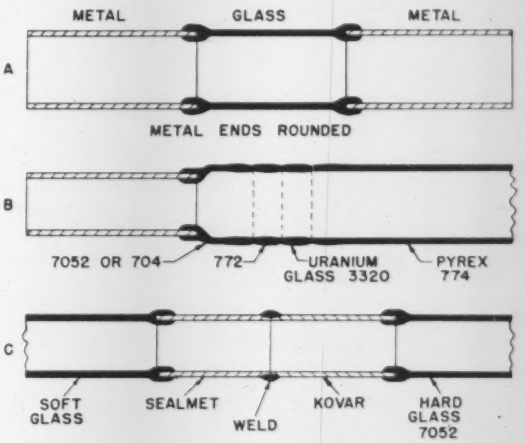


Fig. 89

should be clean and the tube should not be handled at the sealing surface.

4. The Kovar is then oxidized by heating it to a dull red heat. It is removed from the flame and allowed to cool slightly.

5. The short section (6 mm.) of 7052 glass tubing is slipped over the oxidized Kovar tube and a small spot of the glass is fused to the alloy tube to prevent it from slipping, Fig. 88A. The tube is then rotated until the glass is fused sufficiently so that it can be tooled against the Kovar. One must be careful not to occlude any air between the glass and metal interface as the seal is made. To avoid this, it is best to start to tool the glass at one end and gradually work the glass against the metal until the other end is reached. In Fig. 88B the seal is shown well back from the edge of the tube.

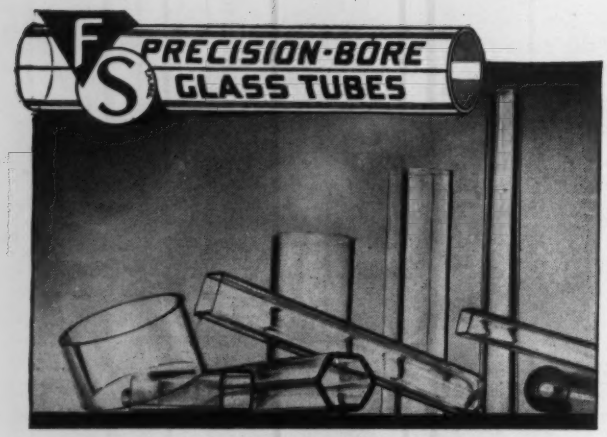
6. The glass tubing is then sealed to the bead glass which is sealed to Kovar by the technique of making a glass-to-glass seal, Fig. 88C. The seals are then annealed by heating in the annealing burner flame, or in an annealing furnace, according to the procedure previously outlined.

Two other seals are shown in Fig. 88D and 88E. The seal glass in Fig. 88D extends to the end of the Kovar tube, while in Fig. 88E the glass extends over the end of the rounded edges of the tube.

The seal illustrated in Fig. 89A is a combination of an internal and external seal. The seal glass is worked over the edge of the Kovar much in the same manner as was described in sealing glass to a copper tube.

If the glass-to-Kovar seal is attached to Pyrex, a graded seal must be made between the 7052 glass and Pyrex. This graded seal is made by starting with a Pyrex tube. This tube is drawn to a point and allowed to cool. The Pyrex tube is then opened at the opposite end with the flame. A tube of uranium glass 3320 is butt-sealed to the Pyrex tube with a minimum of working the two glasses. The seal should be thin. The uranium glass is then cut 4 mm. from the seal. A tube of 772 glass is sealed to the uranium glass and the tube of 772 is cut with the flame 4 mm. from the second seal. The graded glass seal is then sealed to the 7052 glass tube, Fig. 89B. A glass-to-Kovar seal with a graded seal is shown in Fig. 84A and Fig. 82B. The same glass-to-Kovar seal is shown in Fig. 84B. In this example, how-

*EDITOR'S NOTE.—Only in factory production, with high-precision automatic temperature-time control systems, can these recommendations be met *exactly;* most readers would have to rely on all-purpose laboratory furnaces. However, two or three degrees more or less at the holding temperature, and a few minutes longer or shorter in the controlled rate-of-change periods, will not matter.—M. F. Behar.



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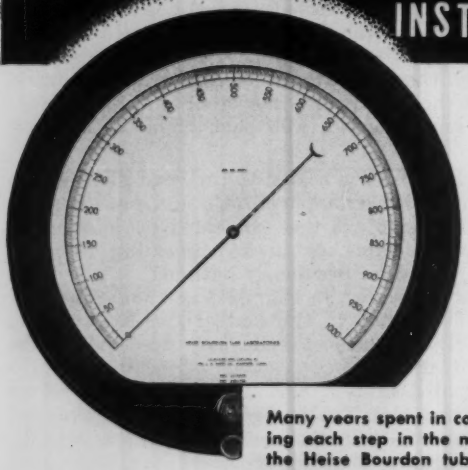

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ever, the glass-to-Kovar seal was made so that the Kovar tube extends beyond the glass-to-Kovar seal. The glass tube has a small bulb beyond the 7052 glass seal. The seals illustrated in Figs. 84D and 84E are made of glass 7052 and Kovar.

A method of connecting soft glass to Pyrex is illustrated in Fig. 89C. A tube section of Sealmet is welded to Kovar. Soft glass is sealed to the Sealmet and 7052 glass is sealed to the Kovar by procedures outlined above.

Another example of glass-to-Kovar seals is illustrated in Fig. 90. Here two seals of 7052 glass-to-Kovar are used to seal the top and extension tube of a trap to the body of the latter which is 7052 glass. The two graded seals of 772, uranium glass and Pyrex, are noticeable on both the inlet and outlet tubes.

A Kovar-to-glass, 7052-to-Kovar, is illustrated in Fig. 82B. An example of a method of connecting a small steel boiler to a Pyrex system is shown in Fig. 82C. The order of the various glasses and metal, top to bottom is as follows: Pyrex, uranium glass, 772 glass, 7052 glass, Kovar, and steel. The steel boiler is fitted with a circular electrical heater which is bolted to the flat bottom.

Kovar rods are frequently used as conductors through glass. An example of four large Kovar conductors through a glass cap is illustrated in Fig. 91. The Kovar rods are fitted with special caps for the glass-to-Kovar seals. The tubulation in the center is used for evacuating the finished tube which will contain the four sealed conductors. The tubulation has heavy walls so that it can be tipped-off by fusing the glass.

Glass-to-Kovar seals have been made by using induction heating instead of a gas-oxygen flame. The high-frequency (40-60-kc.) current is supplied by spark or vacuum-tube

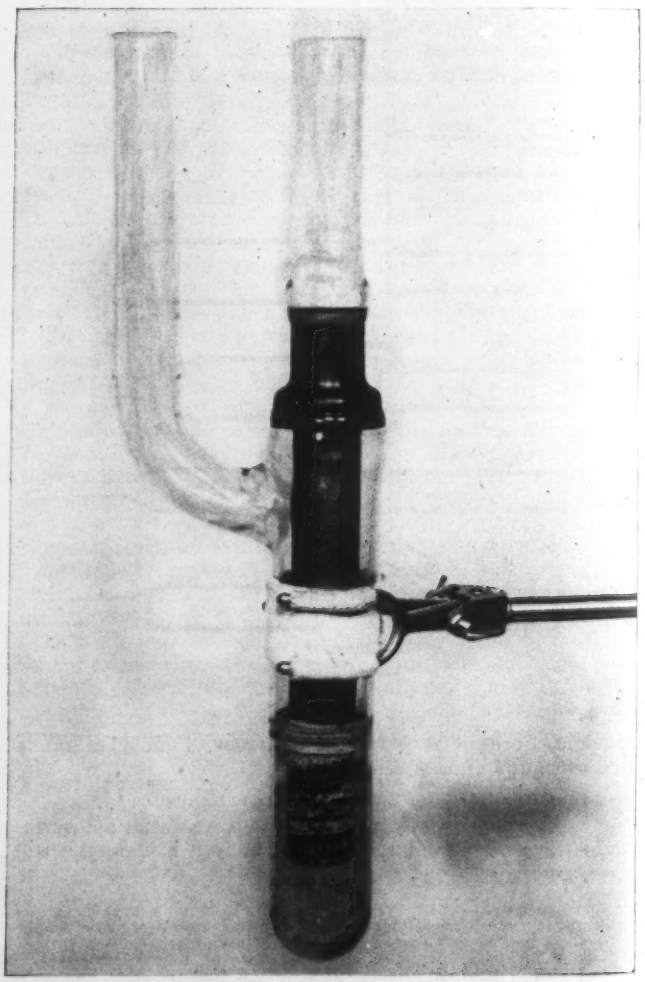

Fig. 90

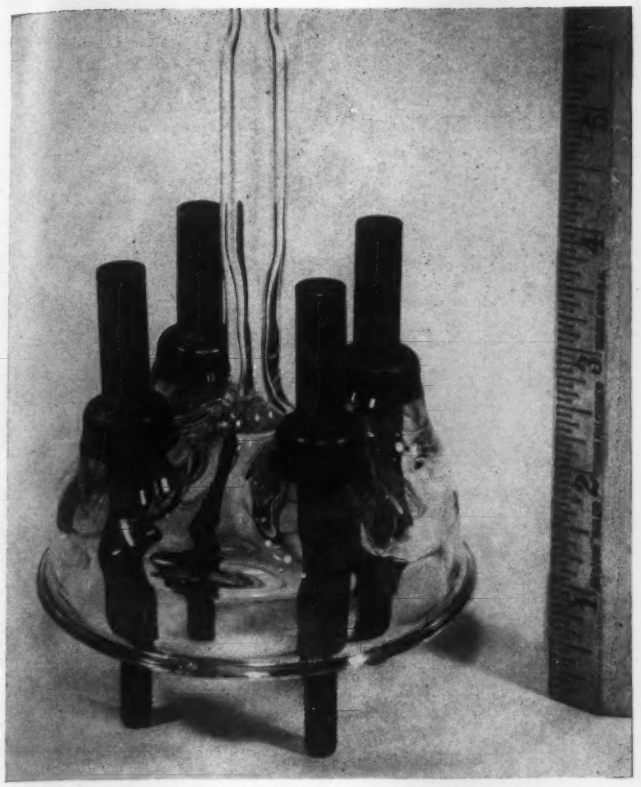

Fig. 91

generators. It is important that the glass and metal parts be in intimate contact because it is the Kovar which is heated by induction, and the adjacent glass is fused by the conduction of heat from the Kovar. This method is useful when it is desirable to make glass-to-Kovar seals on small Kovar parts. The fusion of glass is rapid and the control is quite easy.

Small glass-to-metal seals can be made by hand, but when large seals are required the glass blower must use a lathe. There are two distinct advantages in using a lathe for making large seals:

1. Large and cumbersome sections of glass and metal can be handled by the lathe and the glass blower can use both hands for tooling the glass and directing the flame over various sections of it.

2. The glass and metal are truly centered in a lathe to produce precision seals.

The popular Litton lathe, Model EE[13] is shown in Fig. 92. The head stock at the left is synchronized with the tail stock at the right. The Litton cross-fire which is being used is adjusted in the form of an arc which covers nearly one-half of the circumference of the glass. This burner can be moved, either to the left or right, by the hand wheel behind the burner. The operator is tooling glass against a Kovar surface.

Sealmet

An alloy which contains 51.55% by weight iron, 42% nickel, 6% chromium, 0.12% silicon, 0.29% manganese and 0.04% carbon was developed by the Higrade Sylvania Corporation.[14] This metal has a thermal coefficient curve very close to that of Corning glass number 001. This glass is used in making glass-to-Sealmet seals and the glass is then sealed to the envelope of Corning glass 008. The procedure for making glass-to-Sealmet seals involves techniques very similar to those described for Kovar. Technical data concerning Sealmet can be obtained from the Allegheny Ludlum Steel Corporation, Pittsburgh, Pennsylvania.

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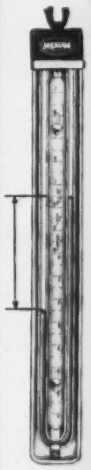

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The Clean-Out Manometer for line pressures up to 100 lbs. per sq. in. A wing nut permits the Manometer body and tube to be disconnected from the head—the tube cleaned with a brush furnished or tube replaced, and the instrument reassembled without disconnecting the head section from the piping. Send for Bulletin No. 1.

The Model A-204 Manometer for line pressures up to 400 lbs. per sq. in. These instruments are built with heavy walled annealed straight Pyrex tubes, gland packed top and bottom in steel end blocks and clamped to the body at fixed intervals to prevent distortion. Bulletin No. 10 gives complete details.

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Fig. 92

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for commercial use. Experimental lamps or bulbs, however, are sometimes required in the laboratory. Since it is not economical to invest in production machines for laboratory work, the procedure for making lamps and tubes by hand will be described.

Two methods can be used for sealing electrodes into tubes. The electrodes are either bead-sealed into the lamp or tube-flare or press-sealed into the glass of the flare. The number of electrodes which can be sealed into a flare will depend on its size.

Single-wire electrodes are made as follows:

1. The flare is made by pulling a point on a tube with the required diameter. The flare is formed on the opposite end by the procedure outlined in Chapter II and illustrated in Fig. 39.

2. This flare is mounted on the glass tube with asbestos tape; the opposite end is shaped for the seal. If the bead seal

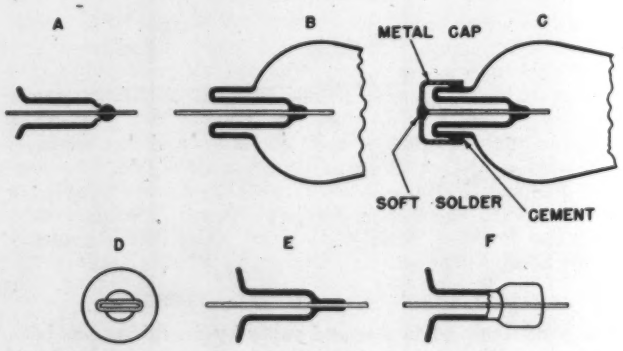

Fig. 93

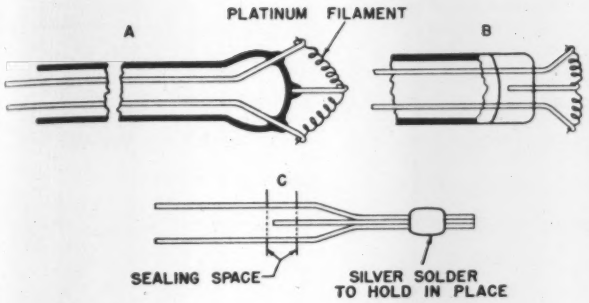

Fig. 94

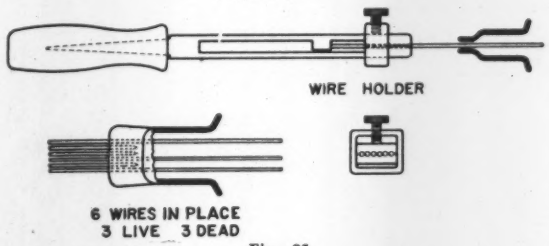

Fig. 95

is used, the opening is made by pulling the tube to a cone and opening this cone. The flare is illustrated in Fig. 93A. The wire is then beaded by the procedure recommended for the type of wire used and the glass bead is sealed to the flare. The assembly is carefully annealed and then sealed into the bulb or tube, Fig. 93B. The electrode is soft-soldered to a cap after it is cemented to the tube, Fig. 93C.

The press seal is used almost exclusively in commercial

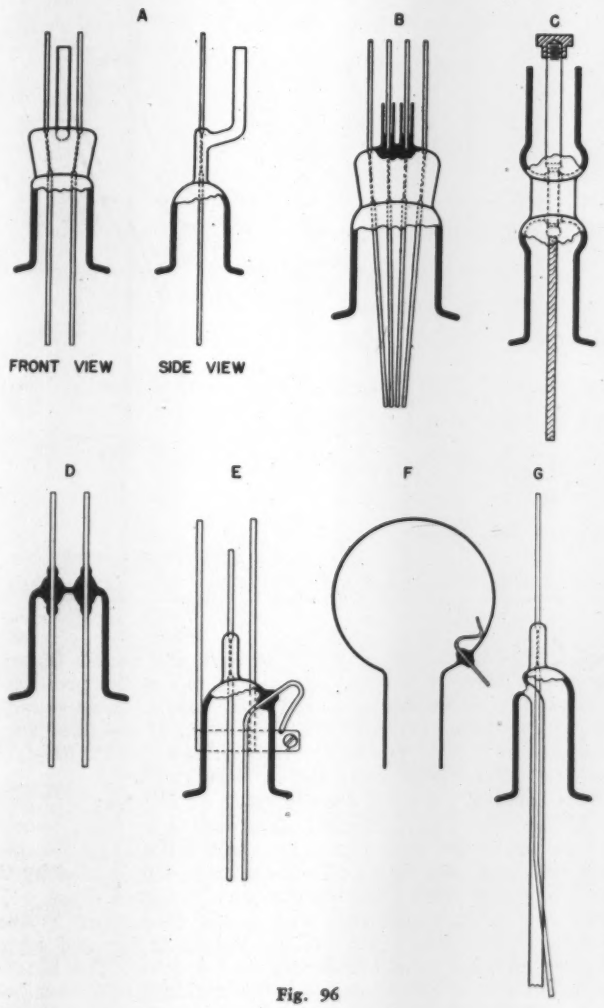

Fig. 96

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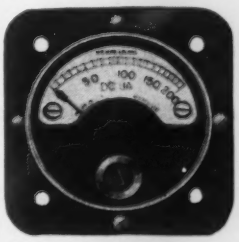
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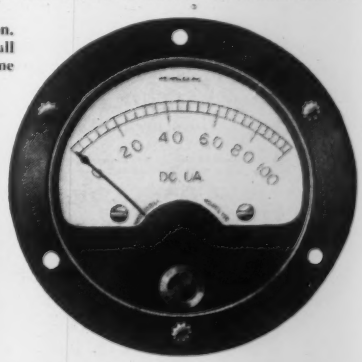

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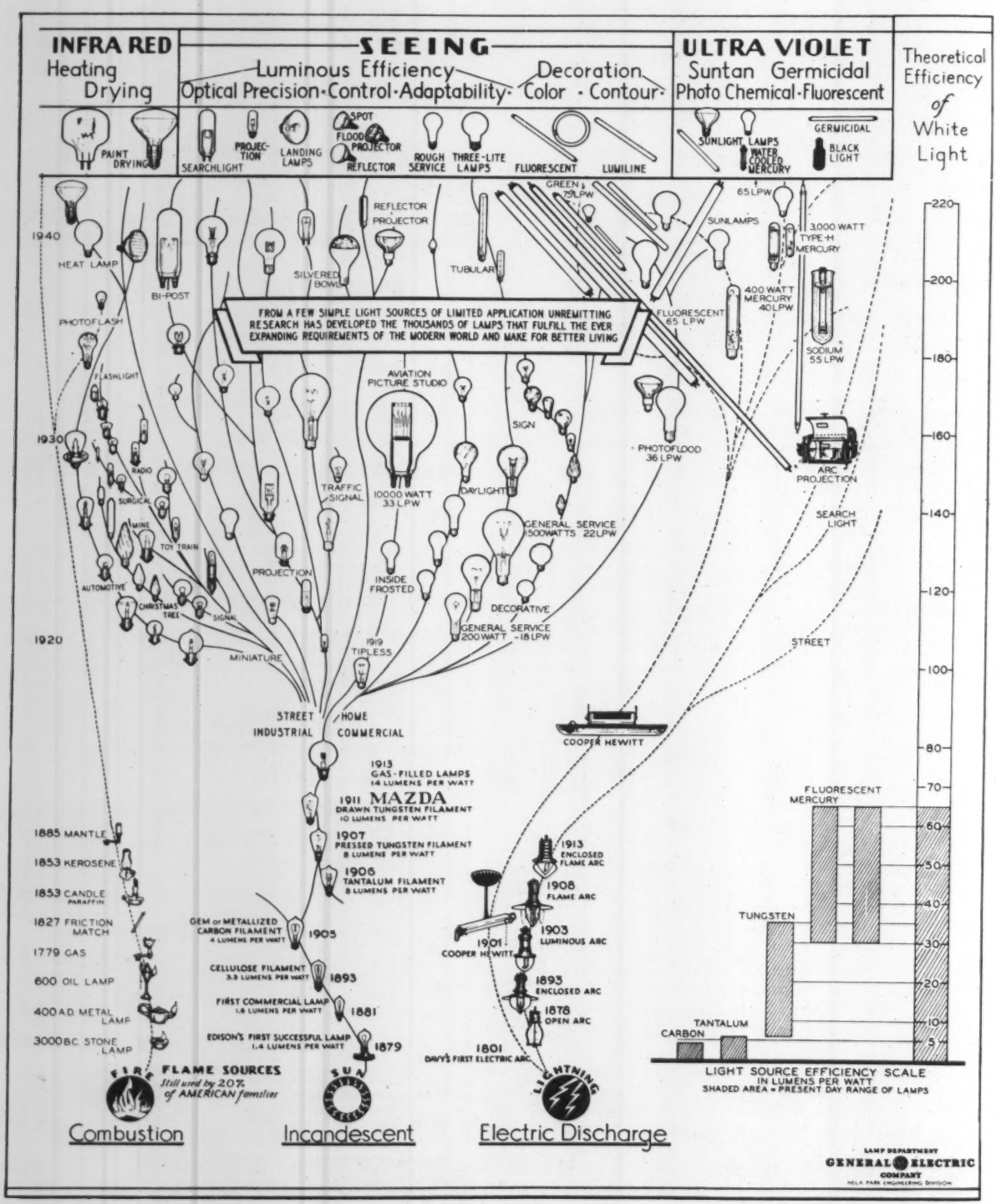

production because it is more easily made in machine production.

1. The flare is made with a triangular tool as described above. This flare is then mounted on a glass tube and the end of the flare-tube is fused and pressed until the end has a form shown in Fig. 93D.

2. The wire is then placed into the glass end and the glass is fused and pressed against the wire. The press seal when correctly made will appear as shown in Fig. 93E and F. The seal is carefully annealed.

3. The flare is then sealed into the tube by a procedure of sealing a flare to a tube. The electrode is then soft-soldered to a cap which is cemented to the tube.

Multiple electrode seals are used more extensively for laboratory installations. Beaded wire electrodes are more difficult to make, especially if several are sealed through the same flare. It is more convenient to use the press seal because the wires can be spaced more easily. As an example of the two types of seals, the production of the flare for a combustion pipette will be described. The electrode assembly consists of two lead wires and a wire support.

The beaded electrode flare is made as follows:

1. The tube for the beaded electrodes is made by blowing a bulb on the end of the tube. This bulb will allow more space for the glass-beaded wire. Two electrodes are beaded by the procedures described in this chapter. Tungsten press welds may be used. These prepared beads consist of a small length of tungsten which is butt-welded to braided copper on one end and to a nickel rod on the other. The beading procedure has been described for making tungsten bead

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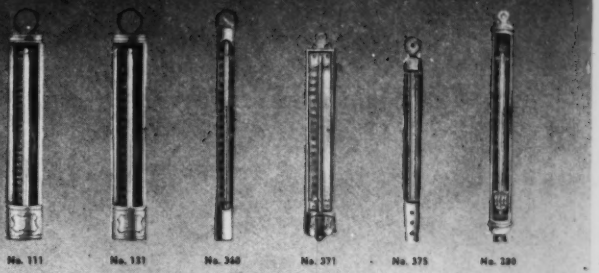

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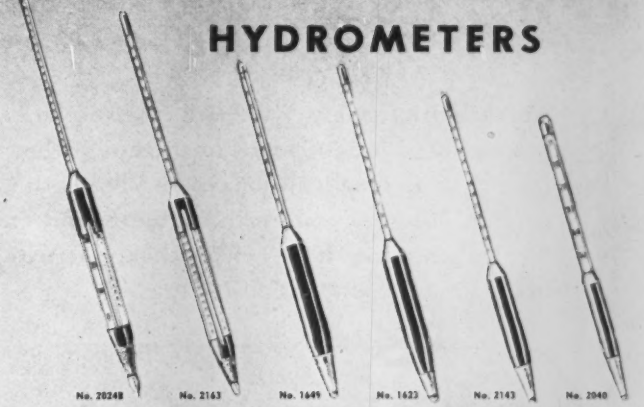

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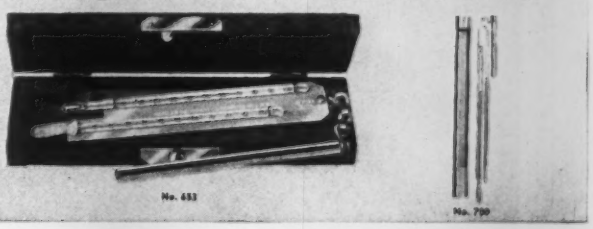

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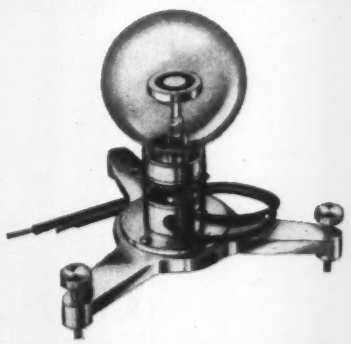

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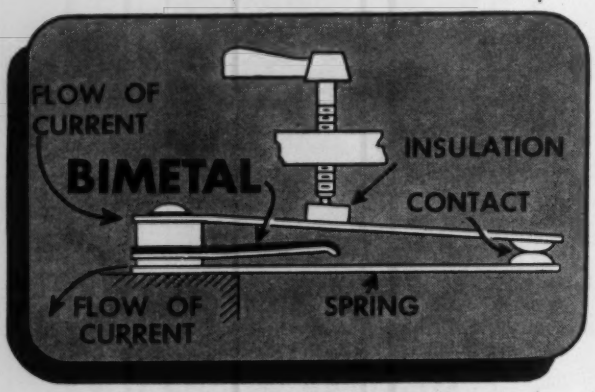

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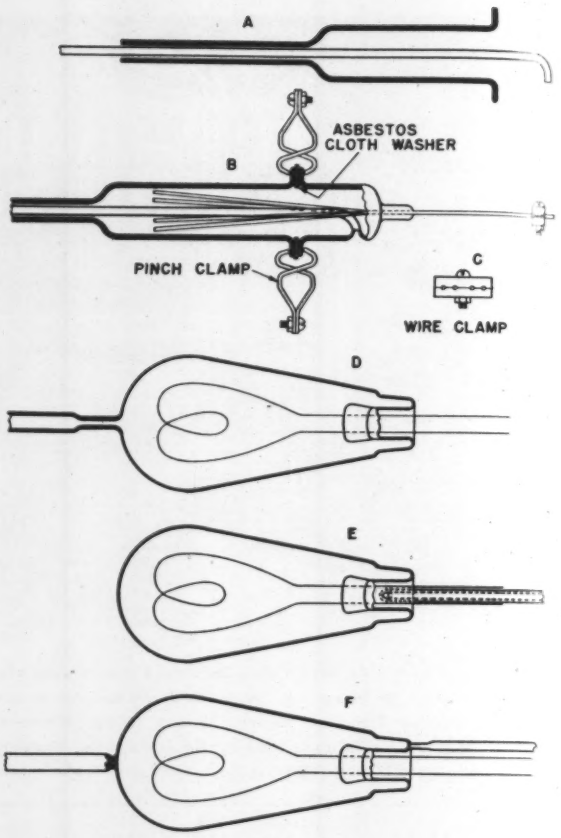

Fig. 97

seals. The filament support has the glass beaded over one end. The three are then sealed into the glass and the filament is spot-welded to the leads (Fig. 94A) after the seals are annealed.

The press seal can be made in about one-third the time required for the beaded electrode seal. The press is made by fusing the end of a tube and pressing it together so that there is just room enough to insert the electrodes. The electrodes and support are silver-soldered together so that each will be held in place by one common holder, Fig. 94C. The electrodes are then put into the press so that the filament support extends to about the middle of the press. The glass is fused and pressed against the electrodes. The assembly is then annealed. The silver solder is removed and the electrodes are bent to the desired angles. In bending electrodes, one should always hold the electrode near the seal with pointed pliers to avoid cracking the seal. The platinum filament is then spot-welded to the electrodes, Fig. 94B.

When a larger number of electrodes are to be press sealed into glass, it is convenient to use the simple wire holder shown in Fig. 95.

Various types of vacuum-tube stem mounts are shown in Fig. 96. The construction of these mounts consists both of the bead and press seals; and numerous modifications can be incorporated into specific assemblies by using construction details from several of the electrode arrangements. These mounts may be used with any of the standard glasses if the correct metal and sealing procedure is used.

Glass rod supports are sometimes convenient and may be sealed to press seals as shown in Fig. 96A. The side view shows the shape of the glass rod. It is best to seal the rod to the press after the wires are sealed in. The rod is straightened after the press seal is completed.

When two electrodes carry sufficient current to cause a short circuit by arcing, it is advisable to seal lengths of 3 mm. O.D. tubing above the seal. The press seal with insulating tubes is shown in Fig. 96B.

The seal illustrated in Fig. 96C is made by using a press weld sealing wire. The lower section is braided copper welded to a metal which can be sealed to glass. The upper

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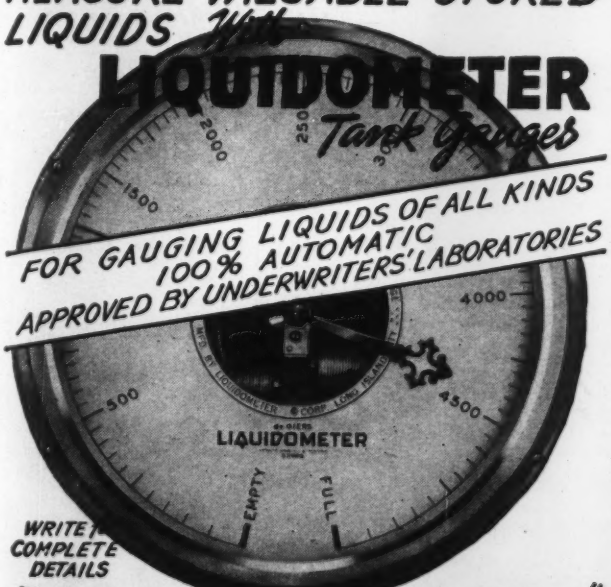

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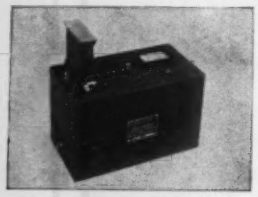

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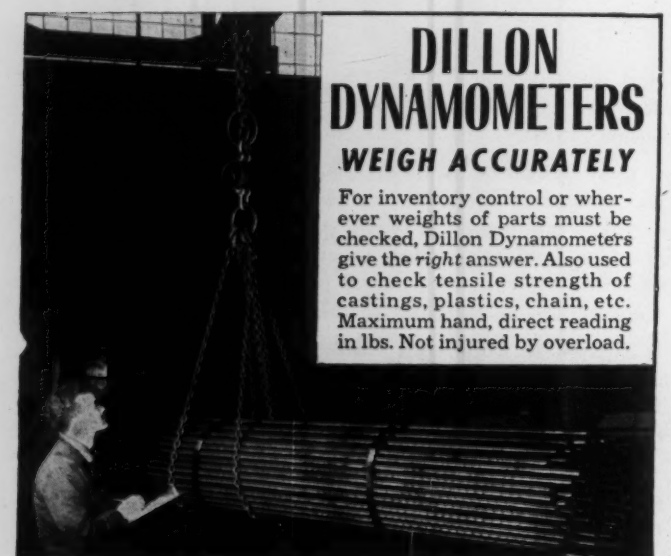

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section, containing the metal plate, is also made of a different metal which is press-welded to the short glass-sealing metal.

A simple two-electrode bead seal is illustrated in Fig. 96D. The seal glass which is beaded to the metal extends beyond both sides of the bead seal.

A convenient method of mounting a plate is illustrated in Fig. 96E. The clamp which supports the plate is fastened and held in position on the flare while the other electrodes are press-sealed through the end of the flare tube.

A lead which contacts the inner surface of a bulb is used in special photoelectric tubes. This electrode seal is illustrated in Fig. 96F. The electrode contacts the inside wall of a tube or bulb which is covered with a metal coating.

A hand-made "tipless press" is illustrated in Fig. 96G. A small thin tube is sealed into the flare. This tube is then used to evacuate the bulb after it is made. The procedure for making this assembly is as follows:

1. A special holder must be made as shown in Fig. 97A. The tube, which has a diameter equal to that of the proposed flare, is sealed to a smaller tube which has an inside diameter of about 5 mm. The large tube section is then flared by the same procedure used in making the tube flare. The tip-off tube can then be held in place as illustrated.

2. The electrodes are press-sealed into the tube flare by using a spacer clamp or a wire holder. The tube-flare is then mounted on the tip-off tube holder as illustrated in Fig. 97B. The tip-off tube is then sealed to the inner wall of the flare. The glass over this small tube is blown out to a small bulb and collapsed several times to insure a good seal. The glass is then blown out to a thin bulb and the opening is fire-polished. When the flare is sealed to the bulb, the small tube is protected from the heat by slipping a quartz tube over the small tube.

Three types of tip-off tubes or tubulations are illustrated in Fig. 97D, E and F.

1. The tubulation at the tip of the bulb is given in Fig. 97D. The bulb is evacuated through this tube and it is then sealed by fusing and drawing the tube from the bulb. Although this type is quite convenient because the tubulation serves as a handle, it is not used in commercial practice at the present time.

2. The type shown in Fig. 97E has been discussed above.

3. The type shown in Fig. 97F is made by using a temporary blowing tube on the bulb and sealing a tube to the edge of the flare. The temporary tube is then removed and the bulb is worked to a smooth surface at this point. The bulb can then be evacuated through the tubulation and sealed by closing and drawing away the small tubulation at the edge of the flare. *To be continued*

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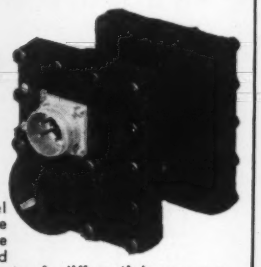
STATHAM PRESSURE TRANSMITTER

Model P7



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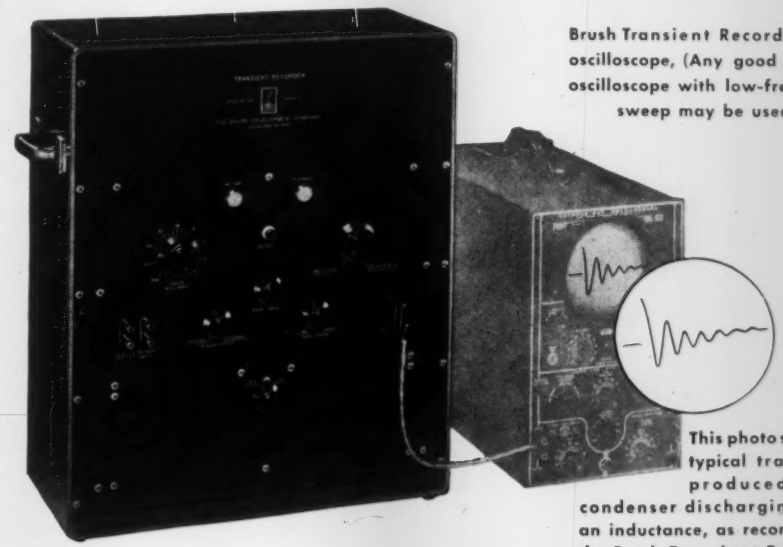

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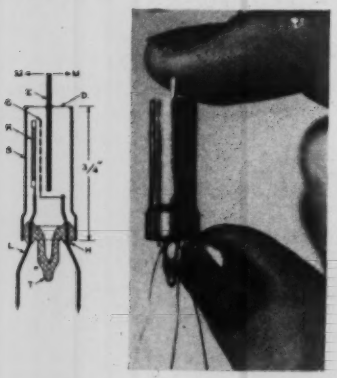
Mechanical-displacement-input Electron Tube

New "Vibrotron" is an inexpensive, practical embodiment, suitable for mass production, of method formerly used only by



experimenters in various laboratories, and reported only in scientific journals, whereby motion imparted to an externally-protruding element alters the electron flow in a vacuum tube. Its first large-scale application will be in phonograph pick-ups, but announcement states that other fields of application are in industrial measurement and automatic control equipment. Announcement mentions that although "Vibrotron" is not yet in production, a limited number would be made available to manufacturers of electronic equipment who are interested in experimenting with it for use in their future products. New tube weighs approx. 0.2 oz., is about 1" long by ¼" diam. Our illustrations show it in actual size. Motion of movable electrode E is transferred through thin metal diaphragm D. Triode consists of cathode K, grid G, and movable anode E. Motion of movable anode in direction MM produces a proportionate change in electron flow. Triode is contained within metal envelope S and has its leads L brought out through vacuum-tight glass header H with exhaust tip T. Development has covered a period of several years and it is said that life tests have shown tube to be "especially stable under temperature and humidity changes," as well as able to "withstand severe treatment over long periods of time."—*RCA Victor Division, Radio Corp. of America, Camden, N. J.*

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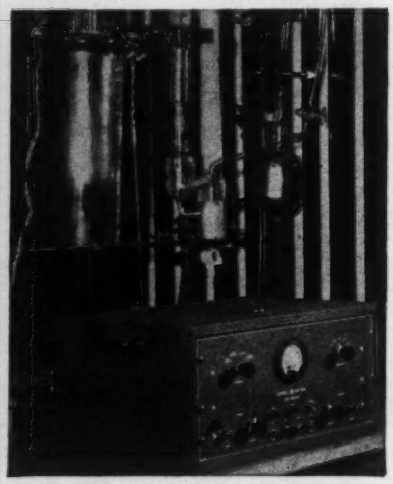
Continuously-indicating Vacuum Gage

New ion gage, able to measure or monitor continuously the highest vacuums ordinarily encountered in factory or laboratory processes, consists essentially of a control unit and an ion gage tube, measures pressures as low as 10^{-7} mm. of mercury. Its continuous pressure indication permits detection of small pressure changes and measurement of slow pressure drifts without the inconvenience of continual adjustments. A protective circuit is provided in control unit to turn off gage filament automatically at pressures above 10^{-4} mm. Control regulates filament emission against line voltage and pressure changes, assuring



stable operation. Ion gage control unit includes emission regulator circuit, a stabilized voltage supply, an electronic microammeter with indicating instrument, and filament protective relay. Front panel contains all controls necessary for operation of ion gage. Gage tube is a special glass triode with a tubulation for connecting to the vacuum system. In operation, gage tube is sealed to high-vacuum system and tube is connected electrically to control unit. Once preliminary adjustments have been made by use of the panel-mounted switches and controls, only infrequent adjustments are required over periods of several hours. —*General Electric Co., Schenectady, N. Y.*

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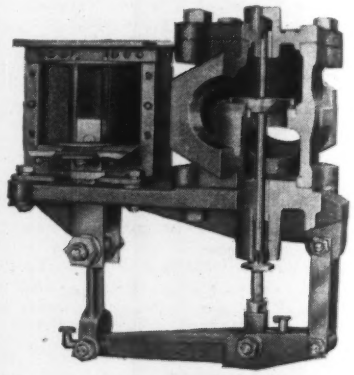
Direct-acting Solenoid Valve for High Differential Pressures

New direct-acting solenoid valve is said to make advantages of an automatic electric valve available for a wide range of applications. It combines immediate full flow with ability to operate under differential pressures as high as 150 lbs./in^2. It can be used for all systems of liquid level control, with hot and cold water, steam, oil and other processing liquids. Solenoid is conservatively rated and lever arrangement provides ample power to insure positive opening of valve. Single-seat construction, manufacturer points out, eliminates trouble sometimes encountered with pilot-operated valves when silt or other foreign matter freezes piston. It also increases temperature range to 365° F. In normal position, valve is closed; when solenoid is energized, valve opens instantly to full capacity. Valve is



designated as a globe screwed type, and is designed and built for heavy-duty service. Body is of cast iron or bronze, tested for 150-lb. pressure, with top cap and bottom section bolted to body. Seat and valve stem are all of stainless steel. Available in two series: "Type HH," sizes from ½" to 1½" suitable for differential pressures ranging from 125 to 150 lbs./in.^{2}; "Type HL," sizes 1" to 3" for medium and low differential pressures. Standard models operate on 110-, 220-, or 440-volt 60-cycle supply.—*Johnson Corp., Three Rivers, Michigan.*

Please mention number 703 when filling out card

Paper Tubular Capacitors

New paper tubular capacitors for by-pass and special-circuit applications, have capacitance ratings ranging from 0.001 to 1.0 microfarads at voltage ratings of 200, 400, 600, and 1000 volts d.c. Manufacturer also announces expansion of facilities for large-scale production of special design "midget" capacitors, which were formerly used in the "Proximity Fuze."—*J. P. O'Donnell and Sons, 316 Stuart St., Boston 16, Mass.*

Please mention number 704 when filling out card

Viscous-fluid Flow-rate Meter with Positive Primary Element

New "Transometer" now makes possible control, integrating, remote indicating and recording, of heavy fuel oil. It is a combination of a piston-type positive-displacement meter and a pneumatic signal transmitter; and is said to be equally valuable with other liquids—particularly viscous fluids—because its accuracy is unaffected by viscosity changes. Having ample power, even at lowest flows, it is said to be ideal for applications where wide flow variations are encountered. *Operating principle*: "Transometer" is, in principle, a fly-ball governor, the centrifugal force of which is balanced by a diaphragm under air pressure. Shaft is driven by extended shaft of positive-displacement meter. As speed of meter changes, fly-ball governor exerts a vertical force according to speed of meter and, since centrifugal force changes with

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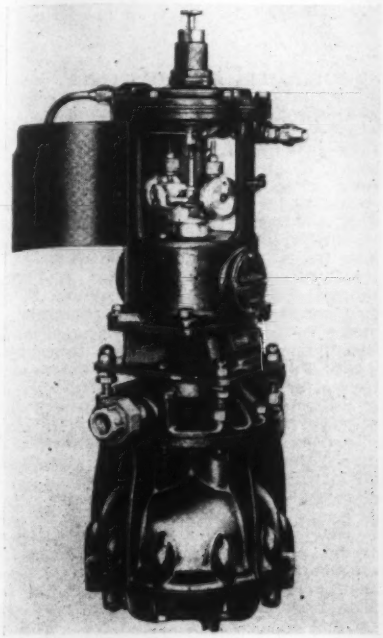
square of speed, force of governor will vary as square of rate of flow through meter. Vertical force of governor is transmitted to an Askania jet pipe, into which air under pressure is introduced. Air leaving jet pipe



enters a receiving nozzle which communicates with a diaphragm at the top, setting up a counter-force on jet pipe. Position of the pipe will always be such that air pressure on diaphragm balances centrifugal force of governor. As a result, air pressure signal will be in direct proportion to speed of governor and therefore a square function of oil flow through displacement meter. Pressure changes of entering air do not affect accuracy of "Transometer" since jet pipe always finds a position in which air pressure on diaphragm balances opposite force of governor. Positive-displacement meter used in conjunction with "Transometer" can be furnished with a counter giving direct readings of total fuel consumption. Recording or indicating instruments with evenly-divided or square-root scales, can also be furnished. —*Askania Regulator Co., 1603 S. Michigan Avenue, Chicago, Illinois.*

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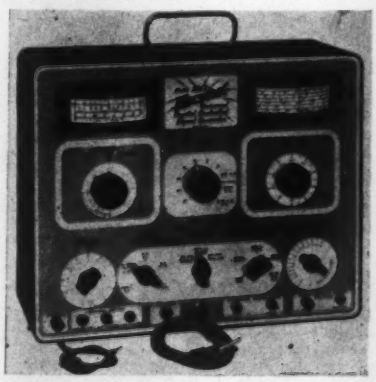
Crystal-controlled Signal Generator

New signal generator has a wide range in radio- and audio-frequencies, power consumption 20 watts at 115 volts. Among its features are: Complete AM coverage from 100 kc. to 110 Mc. Complete FM coverage 100 kc. to 160 Mc. with three variable



bandwidths of sweep: 0-30, 0-150, 0-450 kc. FM. at two self-contained modulating frequencies: 60 and 400 cycles. Provisions for external AM & FM to 15,000 cycles. Self-contained AM at 400 cycles. 0.01% accurate crystal-controlled outputs, both amplitude modulated at 400 cycles and unmodulated. Continuously variable a-f. from 0-15,000 cycles. A-f and r-f. outputs continuously variable from zero to maximum. 60-cycle synchronized sweep voltage available for use with an oscillograph. Self-contained decibel meter with 42" cable. Dimensions: 14" × 16½" × 8". Weight: 28 lbs. Scale: Over 100".—*Hickok Electrical Instrument Co., 10519 Dupont Ave., Cleveland 8, Ohio.*

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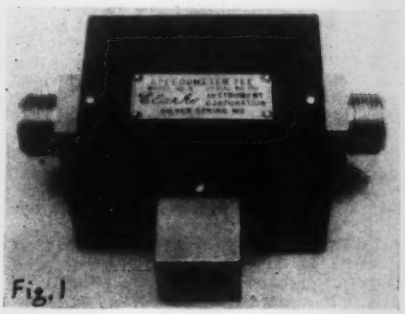
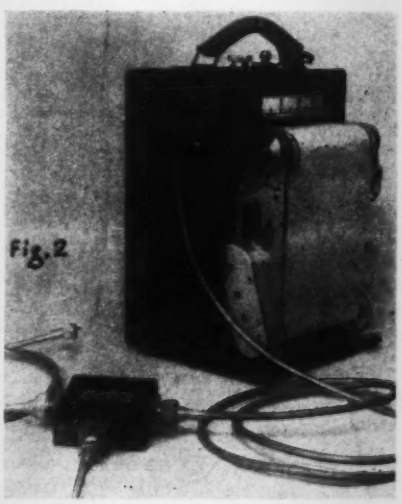
Equipment for Mobile Recording of Field Intensity

New complete equipment for adapting standard Esterline-Angus recorders for mobile recording of field intensity as required by the F.C.C. in proof of performance of FM and television stations includes "Type 101" Speedometer Tee, and "Type



102" Recorder Drive Mechanism, Fig. 2, together with all necessary interconnecting cables. Tee is permanently mounted on the dash or bulkhead of the car and provision is made for normal operation of the speedometer. Recorder drive can be attached to or detached from recorder in five seconds without aid of tools and does not interfere



with normal operation of recorder for any other applications. Chart speeds of 1", 2", 4", 8", or 16" of chart per mile traveled can be selected at will. A control is provided for instantly engaging or disengaging the drive when it is desired to omit recording in areas of no interest to the survey—*Clarke Instrument Corporation, 910 Jackson St., Silver Spring, Md.*

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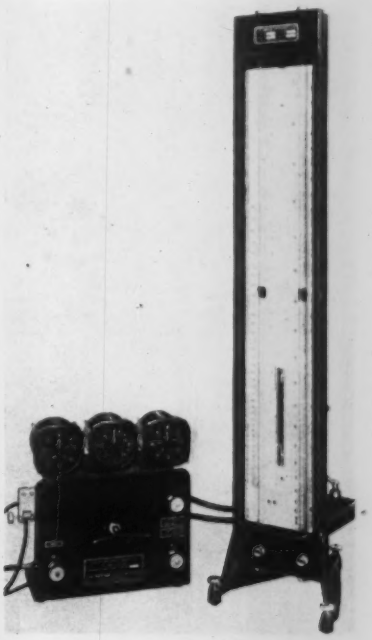
Airspeed Indicator Test Unit

New "Model A-921 Airspeed Indicator Test Unit," for calibrating airspeed indicators, consists of a pressure generator unit



and a two-tube manometer with scales graduated directly in air speed. Manometer, being a primary standard of measurement, is universally used as the reference standard in checking and calibrating airspeed indicators.—*The Meriam Instrument Co., 10958 Madison Ave., Cleveland 2, Ohio.*

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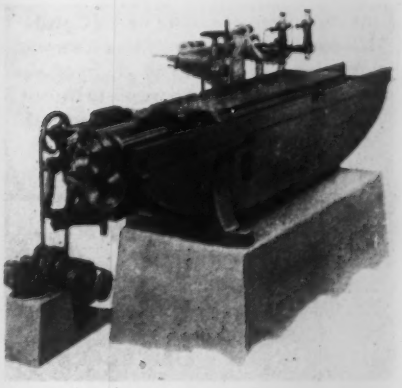
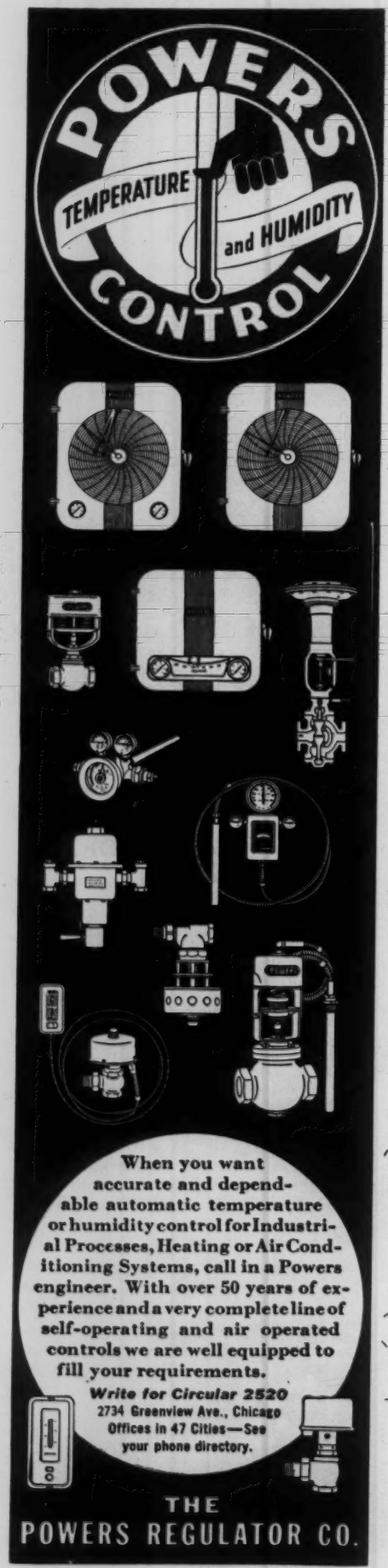
Fully-automatic Linear Dividing Machines

Several new models are added to maker's line of automatic linear dividing machines. These machines automatically rule highly accurate linear scales of practically any pattern or spacing having industrial or scientific application. They retain precision at rapid production speeds. Largest model will rule a continuous scale up to 40" long at a rate of 60 or more lines per minute with a rated accuracy of ±0.0001". Models of lower precision and models of smaller capacity are also offered. Each machine is capable of ruling any one of a large variety of line patterns with up to four different line lengths in a given pattern. Also, each machine will rule scales in either the inch or the metric system as well as the more commonly needed verniers in each system. Operation: After once adjusting machine for a particular type of

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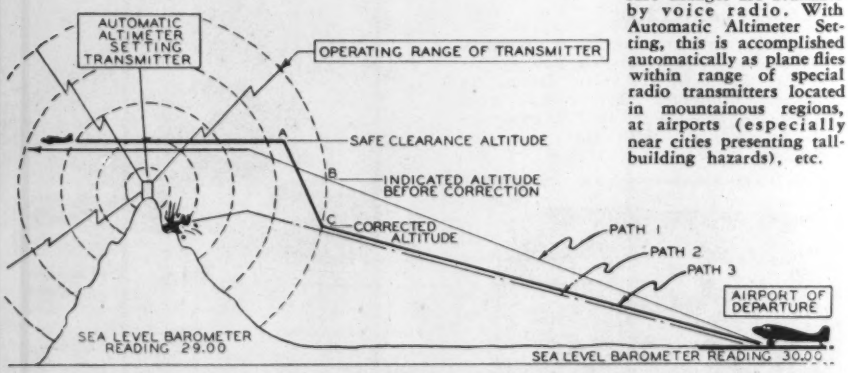
ruling job, operator merely clamps workpiece in position and throws starting handle. Ruling process is thereafter completely automatic, lines of scale being of whatever length, width, depth, spacing, and pattern the operator previously selected. When last line has been ruled, machine stops automatically with ruling tool away from work so that operator may replace the finished piece with a new blank and restart the cycle.—*The Gaertner Scientific Corp. 1201 Wrightwood Ave., Chicago 14, Illinois.*

Please mention number 709 when filling out card

Altimeter Automatically Compensated for Local Barometric Pressure

New "Automatic Altimeter Setting" is a ground radio-telemetering and airborne-altimeter pointer-reset system developed to aid air traffic control and instrument flying efficiency, lessening danger of mid-air collisions between planes, crashes into mountain tops, high buildings and other obstructions, and landing accidents during inclement weather. System comprises (1) new type of altimeter in planes and (2) special transmitters on ground. Altimeter automatically corrects itself for barometric pressure changes as plane flies within range of combination barometers and radio transmitters located at ground stations in mountainous regions, at airports, etc. These transmitting stations are compact lightweight radio transmitters actuated by a ground altimeter. They are self-operative and can easily be combined with existing radio range stations. An automatic cut-out device prevents confusion when an airplane is flying within the signalling range of two ground stations: device automatically cuts out weaker signal. Correct altimeter setting is extremely important for two reasons: (1) If it is neglected, altimeter may misindicate by as much as 1000 feet and create an extremely dangerous situation. (2) For traffic control: blind-flying airplanes are assigned definite altitudes by Air Traffic Control and if an airplane varies more than 100 feet from the assigned altitude, a traffic hazard is created. At present, with voice radio system, ground operator gives pilot correct setting (which is a four-digit number such as "three-zero-five-three") by pronouncing this number over his radio. Pilot must hear number and remember it long enough to manipulate his altimeter to obtain correct reading. Sources of error in this procedure are considerable. In new system, each ground altimeter sends out its own altimeter setting continuously in the form of a coded radio signal; airplane's altimeter receives this signal, automatically decodes it and sets itself in accordance with it. Announcement of new "Automatic Altimeter Setting" points out that it would eliminate one further aviation hazard at present difficult to deal with: tendency of an altimeter to give incorrect readings when air temperatures aloft are unusually high or low, compared to the "standard conditions." Thus, an airplane flying over Rocky Mountain regions might obtain the latest altimeter setting from an airport located in a valley (say 3,000 feet above sea level). This setting would be correct if pilot intended to land at the valley airport, but at his altitude (say approx. 12,000 feet) this setting is not necessarily correct: if the ambient air is abnormally cold at that altitude, pilot may think he is flying at 12,000 when he is actually flying at, say, 10,500 feet. This abnormal-air-temperature error can be entirely eliminated by placing Automatic Altimeter Setting ground stations upon mountain tops along the airways. *Operational checks:* Two provisions enable pilot to make sure the system is operating properly: (1) He may manually set his altimeter to any arbitrary figure. If system device is working correctly, altimeter returns itself to its original setting. (2) Pilot can feed his own altimeter a coded signal which represents "29.92," the altimeter setting which represents standard atmospheric conditions. In other words, pilot "fools" his altimeter into believing such a signal has been sent to it from the ground. If system is functioning properly, altimeter immediately sets itself to "29.92." Then, when pilot ceases to give this check signal, altimeter returns to

Barometric scale, visible through window at right, is adjusted by knob at bottom and can be set to any pressure level within scale range. With present method, to travel any distance, instrument must be adjusted manually during flight as notices of barometric pressure changes are available by voice radio. With Automatic Altimeter Setting, this is accomplished automatically as plane flies within range of special radio transmitters located in mountainous regions, at airports (especially near cities presenting tall-building hazards), etc.



Pilot plans to fly Path 1, having set his altimeter according to sea-level barometric reading at airport of departure.

With only airport setting, pilot flies Path 2. Sea-level barometric pressure gradually drops as plane approaches mountain; altimeter reads higher than it should and plane crashes into mountain.

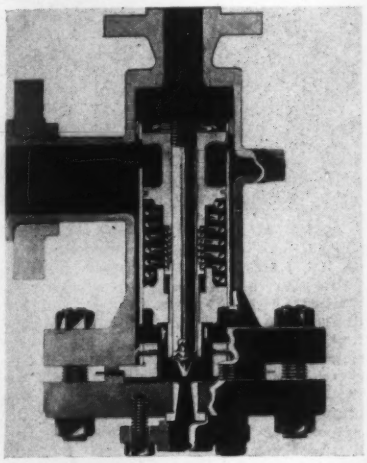
With automatic altimeter setting system, pilot follows Path 2 until plane comes within range of system's automatic transmitter. Here, airplane's altimeter receives correct setting signal by radio and automatically adjusts itself: altimeter pointer moves from indicated altitude *B* to actual corrected altitude *C*. Noting that he is at a lower altitude than that of his intended course, pilot climbs to safe clearance altitude *A*, Path 3.

correct reading in accordance with nearest ground station. *Coding Method:* A four-digit figure from each ground altimeter station must be expressed by a radio signal in such a manner that the airborne altimeter can "read" and "understand" it and set itself accordingly. Method tentatively selected is to radio an audible musical note of definite pitch. Loosely speaking, a high C would mean an altimeter setting of 28.60; A low note might mean 31.10. Airplane's altimeter contains an audio frequency analyzer which measures pitch of incoming signal precisely and then causes the altimeter to set itself accordingly. — *Kollsman Instrument Div., Square D Co., Elmhurst, L. I., N. Y.*

Please mention number 710 when filling out card

Automatic Recirculating Valve

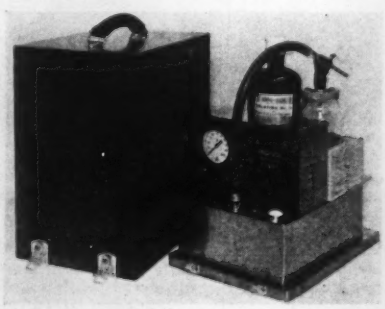
New Recirculating Valve prevents centrifugal pump failures resulting from insufficient flow of fluid through pump. It is operated from the fluid flow and is designed to by-pass minimum quantity of fluid required to eliminate pump overheating. As quantity of fluid passing through pump increases, by-pass quantity is automatically throttled and reduced to zero when pump output is sufficient to prevent pump failure. Valve may be installed in existing pump piping by removing any convenient elbow in discharge piping upstream of all checks and stops.— *Hammel-Dahl Co., 243 Richmond St., Providence 3, R. I.*

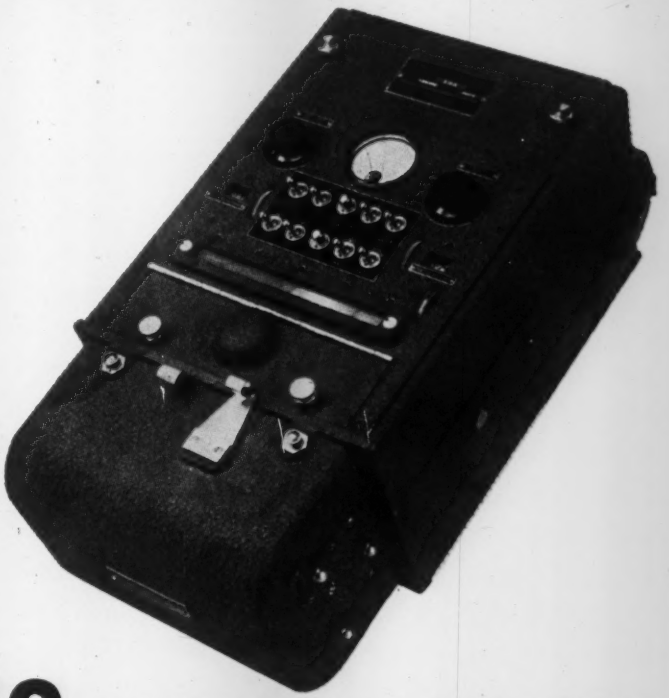


Please mention number 711 when filling out card

Cleaning Kit for Instrument Parts

New "PC-2 Portable Precision Cleaner" will chemically clean ball bearings, jewel bearings, optical mirrors, gages, measuring and recording instruments. It utilizes "Eng-Sol Method." Compressed air at 80 lbs./in.^{2} is passed through a ceramic filter and thermostatically controlled heater. Combined with a triple-distilled chlorinated hydrocarbon, this pre-treated air bombards the surface to be cleaned: high-velocity particles of solvent are driven into surface pores,





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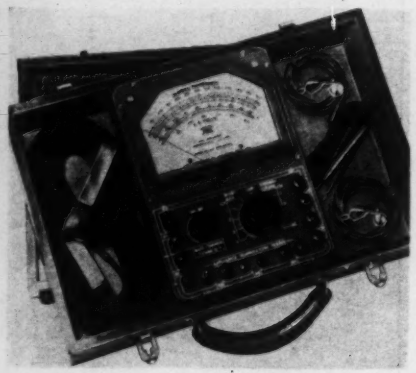
dissolving soluble matter. Air blast drives out insoluble material. Solvent is used only once, eliminating the possibility of leaving a film of oil or grease. Dirt and lint are also easily removed. Gaging to 0.000001″ is possible after cleaning with "Eng-Sol Method." Sprayer is precision machined and laboratory calibrated to deliver an atomized spray. "Eng-Sol" solvent cannot burn nor explode. Kit is available for permanent table installations.—*Passaic Analytical Laboratories, Inc., 228 Aycrigg Ave., Passaic, New Jersey.*

Please mention number 712 when filling out card

Appliance Temperature Tester

New "Model 60-JRT," is designed for rapid check of operating temperatures of refrigerating equipment and ovens of gas or electric ranges. It checks four cold zones



and two heat zones simultaneously. It gives continuous readings outside the equipment being checked, so that operator can follow results of adjustments without opening doors. It measures temperatures from —100°F. to 80°F. as a resistance thermometer; from 0° to 600°F. as a thermocouple millivoltmeter with bridge compensation for ambient temperatures. Also measures line voltage from 0 to 300 volts a.c.—*J-B-T Instruments, Inc., New Haven 8, Conn.*

Please mention number 713 when filling out card

Insulation Tester with VTVM

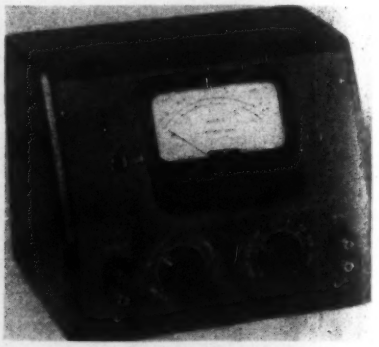
New "Model 665A" Insulation Tester is called the "Billionaire" in recognition of insulation resistance range up to 10 billion ohms. In addition, instrument includes a vacuum-tube voltmeter, ohmmeter and "capacitymeter," covering 29 measurement ranges for practically every laboratory or service testing job. Indicator is 8″ size, is accurate to 2% at full scale. Automatic

line voltage check is said to provide as well as d-c. regulation to assure accuracy and stability. An automatic ohmmeter battery check maintains accuracy of low-range ohmmeter by warning operator when to replace battery. The "Billionaire" measures 9¾″ × 12½″ × 6″, weighs 13 lbs. complete in a metal case with 4 leads, ready to operate.—*Radio City Products Co., Inc., 127 W. 26th St., New York City.*

Please mention number 714 when filling out card

Vacuum-tube Voltmeter

New "Model 45 Electronic Voltmeter" is a highly stable amplifier type of voltmeter with a logarithmic indicator. A range of

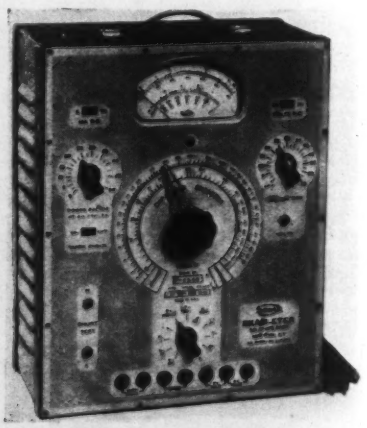


0.0005 to 500 volts at frequencies from 7cps. to 1.6Mc + 2% makes instrument suitable for all voltage measurements in the vibration, audio, supersonic and broadcast frequency bands. Input impedance of 5 megohms and 15 mmf. insures least possible disturbance. Complete range is covered by 6 switch positions. Output measurements can be made on low-level microphones and pick-ups. Db scale is linear. Line voltage variations from 105 to 125 will vary the readings at all frequencies within the specified range by less than + 1%.—*Instrument Electronics, 253-31 Northern Blvd., Little Neck, L. I., N. Y.*

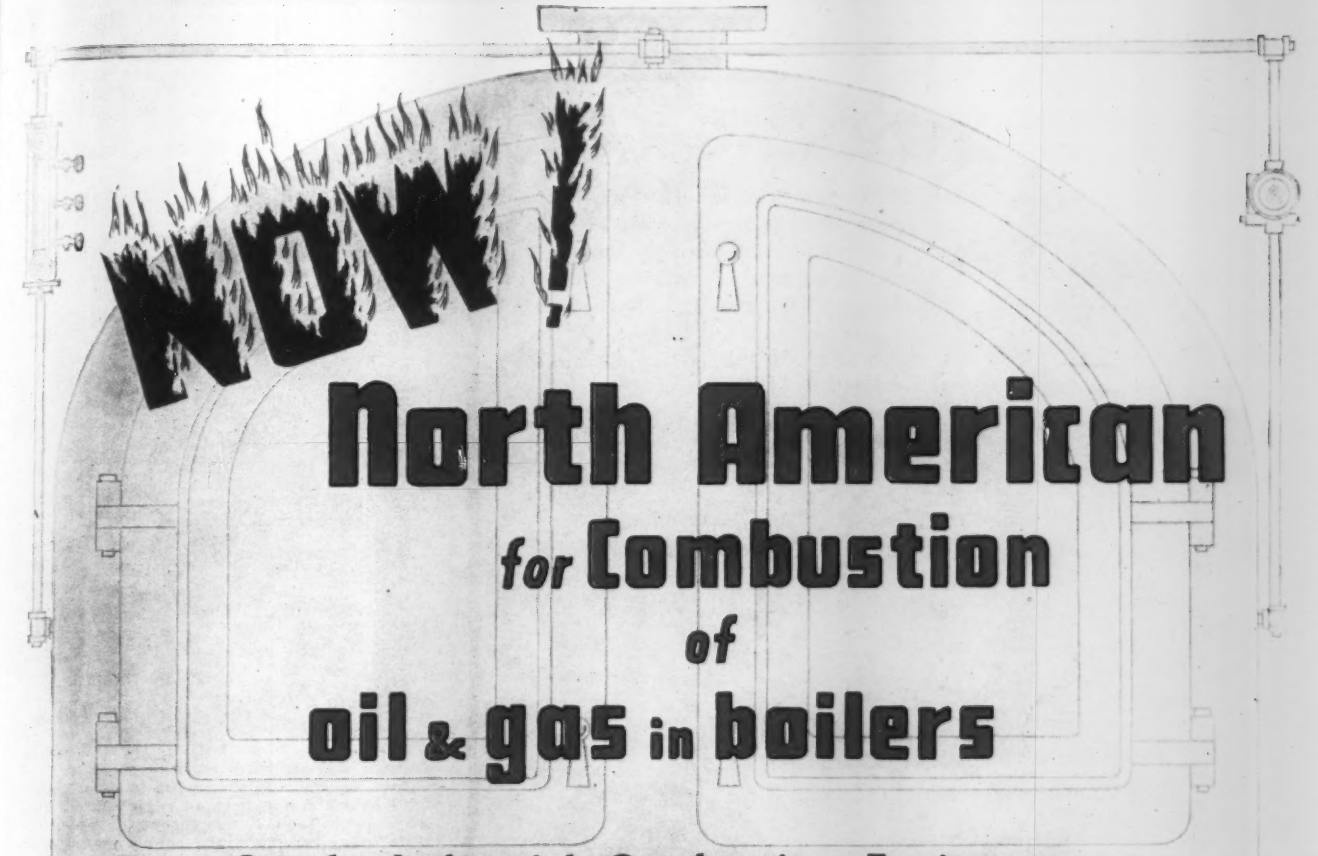
Please mention number 715 when filling out card

Capacitor Analyzer

New "Model CF Exam-eter" features patented "Quick-Check" oscillator circuit for spotting intermittent, open-circuited and



short-circuited capacitors without necessity of unsoldering them from electrical circuits. It contains a d-c. bridge to check capacitances from 10 mmf. to 2000 mf. and resistances from 100 ohms to 7.5 megohms. Capacitor power-factors up to 55% are read on an auxiliary bridge scale. The 4½″ indicator is also used to measure electrolytic capacitor leakage currents under rated voltage from a self-contained continuously-adjustable d-c. voltage supply. Extra test



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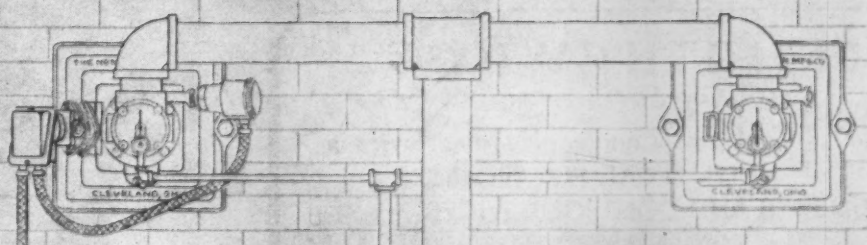

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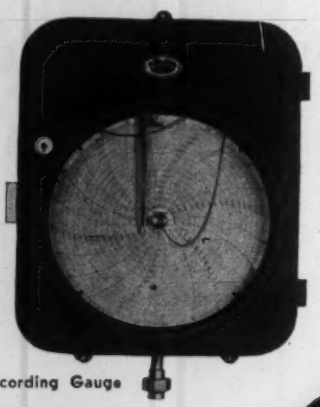

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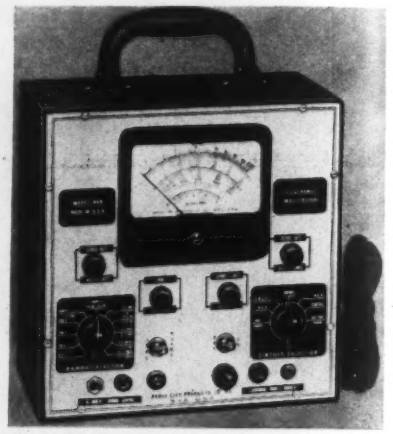
jacks permit overload-proof external vacuum-tube-voltmeter measurements up to 600 volts d-c. and 50 volts a.c. An electronic test circuit supplements the bridge for measurements of capacitor insulation resistance up to 10,000 megohms.—*Solar Mfg. Corp., 285 Madison Ave., New York 17, N. Y.*

Please mention number 716 when filling out card

Vacuum-tube Voltmeter

New "Model 668" is an a-c. and d-c. "vacuum tube volt, ohm and capacitymeter" designed to speed production testing. Line



voltage adjustment, multiple resistors accurate to 1%, an ohmmeter battery under load to determine need of replacement, and a 40,000,000 to 1 measurement ratio for the "capacitymeter" are said to contribute to precision operation. Safety is assured by an easily replaced line fuse, thorough shielding and elimination of danger of shock. Instrument cannot be damaged by using a low range on high-voltage readings.—*Radio City Products Co., Inc., 127 W. 26th St., New York City.*

Please mention number 717 when filling out card

Insulation Resistance Tester

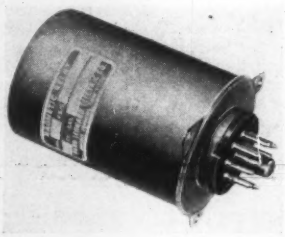
New "Ideal Insulation Tester" is designed for checking insulation resistance in a-c. and d-c. equipment. It is self-contained and ready for instant use anywhere. There are no batteries or external power supplies, no brushes or commutators: necessary power is provided by a small internal hand generator which is operated by a slowly-turning crank. (Crank can be turned in either direction.) Correct testing voltage is indicated by two small button lights that glow at 500 volts d.c. When crank is turned faster than necessary, an electronic voltage regulator controls voltage so that a true

reading is obtained. Test range is 0-100 megohms; Case, lightweight two-piece aluminum; Indicator is d'Arsonval type; Test leads, 10′ long; Dimensions, 3⅜″ × 6″ × 3¼″ high; Weight with leather carrying case, 3½ lbs.—*Ideal Industries, Inc., 1415 Park Ave., Sycamore, Illinois.*

Please mention number 718 when filling out card

Midget Plug-in Relays

New hermetically-sealed plug-in relays are designed for a-c. or d-c. operation in small radio transmitters, aircraft control



circuits and other applications where space is limited. Completely encased in a cylindrical can with standard octal plug base, these midget type relays provide excellent protection against adverse atmospheric conditions. They are available in contact combinations to double-pole double-throw with a-c. contact ratings (at commercial frequencies) of 4 amperes, from 0 to 115 volts and d-c. contact ratings of 0.5 ampere from 25 to 115 volts. They are vibration-resistant to 10 *G* and are provided with self-aligning silver-to-silver contacts—*Ward Leonard Electric Co., Mount Vernon, N. Y.*

Please mention number 719 when filling out card

High-frequency Vacuum-tube Voltmeter

New "Model 410A" High-frequency Vacuum-tube Voltmeter is a multi-purpose instrument for laboratory and production-line use. It measures a-c. voltage from 20 cps. to 700 Mc., d-c. voltage at 100 megohms input impedance, and resistance from 0.2 ohms to 500 megohms. For making a-c. measurements a special low-capacity probe is employed which incorporates a new diode especially developed by Eimac for this in-

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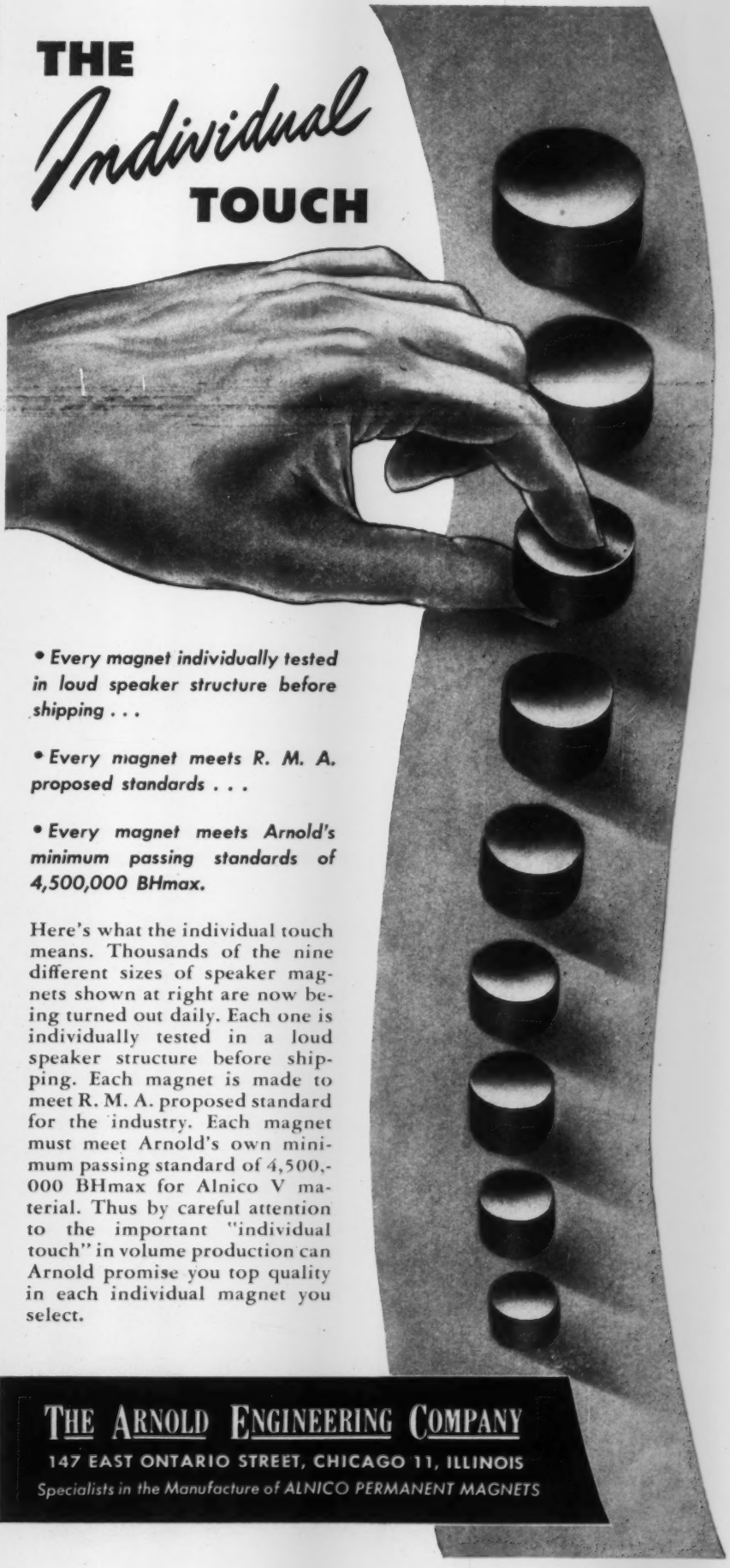

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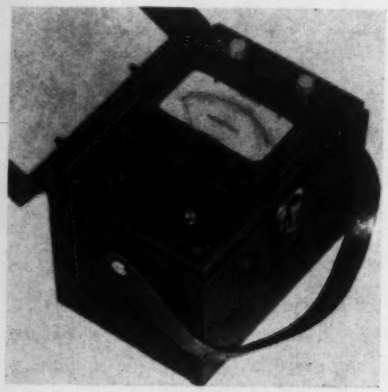
strument. Input capacitance is 1.3 mmfd; input resistance is 6 megohms below 10 Mc., less at higher frequencies owing to dielectric losses. On a.c., "Model 410A" reads 1 volt full-scale to 300 volts full-scale in 6 ranges. D-c. measurements may be made from 1 volt full-scale to 1000 volts full-scale in seven ranges; input impedance for d-c. measurements is 100 megohms for all ranges. For making a-c. measurements in low impedance circuits, the probe may be stored in a compartment in the instrument and connections made to binding posts on the front panel. Overloads will not damage the instrument.—*Hewlett-Packard Co., Palo Alto, Calif.*

Please mention number 720 when filling out card

Insulation Resistance Tester

New "Model 261 Vibrotest" is a portable self-contained insulation resistance-measuring instrument, testing to 50,000 meg-

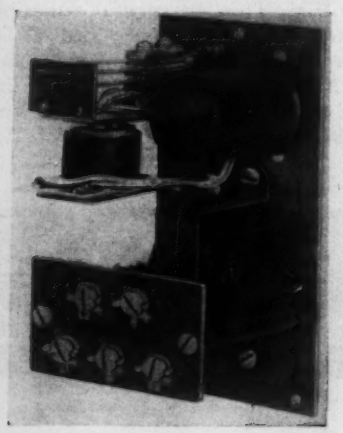


ohms (center scale 1200 megohms). It is said that utmost accuracy is insured by hand-stepped scale, calibrated against known standards of resistance. Instrument has a high voltage regulator in the measuring circuit. It is equipped with capacitor charging circuit to facilitate faster testing of capacitors or capacity circuits. "Model 261" has its own power supply, instantly available. Two No. 6, 1½-volt dry cells provide ample power of 500 volts. Instrument is thoroughly tested and checked for extremes of temperature variations, from −40° to 140°F. It is effectually guarded to eliminate stray leakage, and for operation in extreme humidity. "Model 261" is compactly housed in weatherproof metal case with carrying strap. Size 8⅞" × 6" × 8¼". Weight 17½ lbs.—*Associated Research, Inc., 231 So. Green St., Chicago 7, Illinois.*

Please mention number 721 when filling out card

Cold-cathode Thyratron Relay

New "Electronic Relay" utilizing new principle—the hot cathode thyratron—may be used in electrical control circuits with



advantage over ordinary vacuum-tube and cold-cathode devices. Principal characteristics are: (1) Snap acting; (2) High contact capacity; (3) Trips by either external contact carrying 3 microamperes or any external circuit whose value drops to 1 megohm pure resistance. Applications are: (1) In photocell circuits, for control of motors, valves, alarms, etc.; (2) Motion and limit control within microinches; (3) Converting delicate contact-making instruments into positive control devices without causing arcing or welding of electrodes; (4) Liquid level control where electrodes may be immersed in a tank. Operation is from 110 v., 60 cy. a.c. Switching action is SPDT, or up to 4PDT for loads to 12 amps., 110 v., a.c. non-inductive. Mercury contacts are supplied for contacting loads to 30 amps. While design is suitable for mounting unenclosed, general-purpose as well as dust-tight enclosures are available.—*Automatic Temperature Control Co., 67 E. Logan St., Philadelphia 44, Pa.*

Please mention number 722 when filling out card

Copper Oxide Rectifier

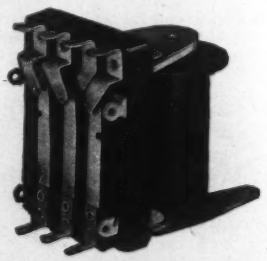
New "Model CO12D4F" copper oxide rectifier is conservatively rated at either 6 volts a.c., 4½ volts d.c., or 35 milliamperes

d.c; is designed for control applications. Unit is completely sealed, with a special plastic compound, against moisture and corrosive vapors. Pre-soldered lead wires prevent damage from overheating during assembly.—*Bradley Laboratories, Inc., 82 Meadow St., New Haven 10, Conn.*

Please mention number 723 when filling out card

Two- and Three-pole Relays

New "Series 16" line of two-pole and three-pole relays feature shockproof action under stress as high as 10*G*. Relay is de-

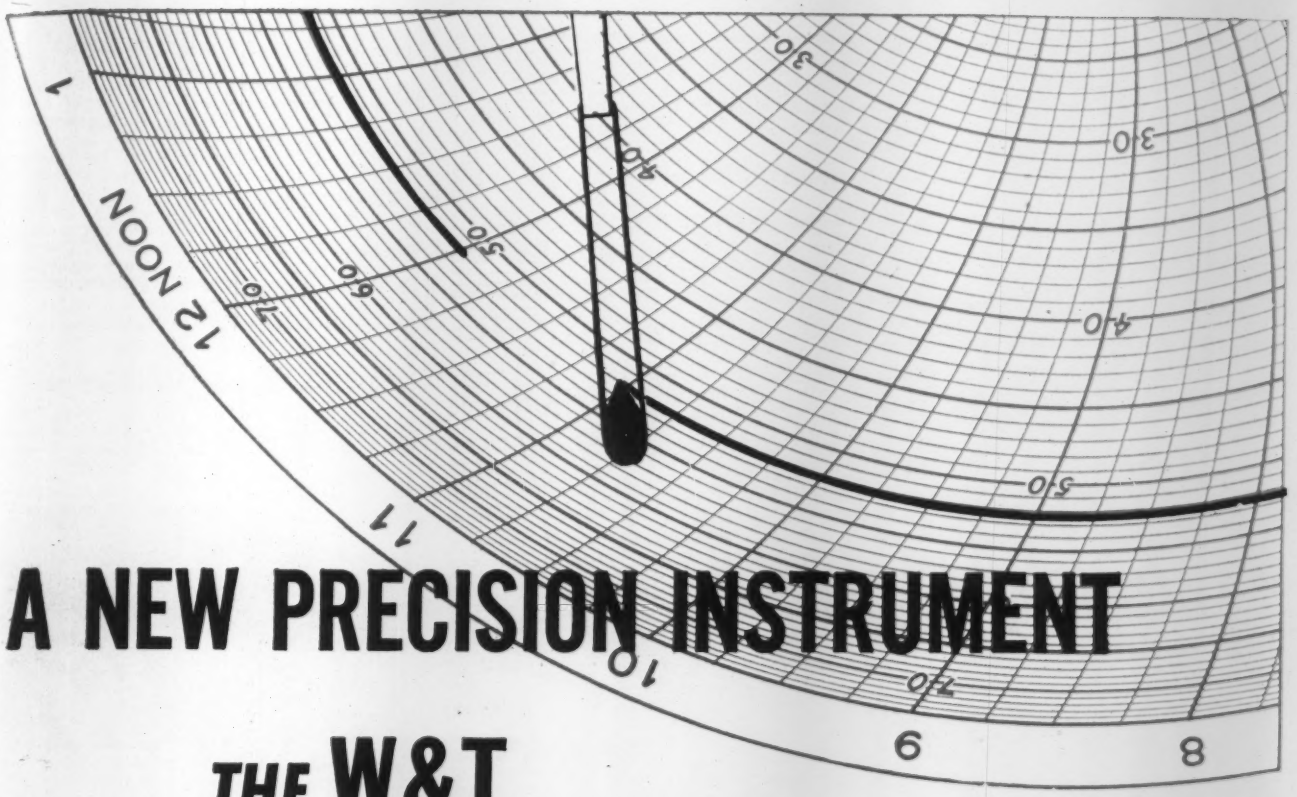


signed so that actuating armature is insulated from contact arms by a Bakelite link. This feature reduces chatter and provides a dielectric strength of 1500 volts between all contacts and ground. Rated for 2 watt operation, coil will dissipate as much as 4 watts in continuous operation without overheating. Any two- or three-pole contact combination is available. The contacts are rated 2 amperes at 100 watts. A coil may be selected for any d-c. voltage between 0.5 and 150 volts, any a-c. voltage between 3 and 500 volts. Approx. dimensions, 2" long × 1 5/16" wide × 1¾" high. Weight, approx. 4 ounces.—*Kurman Electronics Corp., 35-18 37th St., Long Island City 1, N. Y.*

Please mention number 724 when filling out card

A-c. or D-c. 1-kw. Relay

New "Series 41" Relay has approximately same sensitivity as maker's "Type 4" relay, while eliminating a number of features not needed on many high-volume applications. Simplified construction allows makers to offer a serviceable unit at a low price. Small size and light weight are among fea-



A NEW PRECISION INSTRUMENT

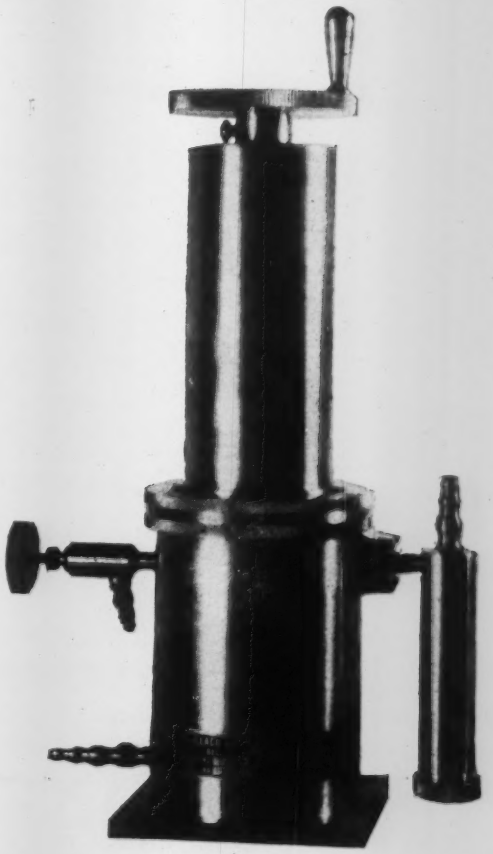
THE W&T
ANEROID MANOSTAT

Pressure or vacuum systems under normal laboratory test conditions can be maintained at set pressure with no readable deviation when controlled with the new W&T Aneroid Manostat.

Covering a range of 3 to 60 inches of mercury absolute pressure, the instrument is manually adjustable over the full range and automatically compensates for variation in the vacuum or pressure source and for changes in barometric pressure.

This precision control of a pressure system is especially valuable in instrument calibration and other controlled-pressure inspection and test work.

Write today for Technical Publication 257 describing this new tool for research and industry.



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BELLEVILLE 9 **NEW JERSEY** A-50

WEAR RESISTANT
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SUPER-POLISHED
Yes, Extra Value!
Long after the ordinary pivot has worn out you'll find PERMO-PIVOTS in the prime of life—faithfully keeping precision instruments precise! It's all due to the special PERMOMETAL tip—the ideal osmium alloy. . . . Made to your specifications.
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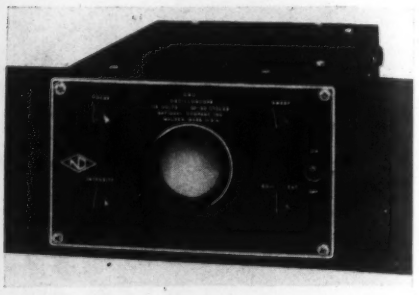
MANUFACTURING METALLURGISTS

tures. Plug-in type weighs 3 oz. and measures 1½" × 1½" × 1⅞"; unenclosed relay weighs 2⁵⁄₁₆ oz. and measures 1" × 1⅞" × 2³⁄₁₆" long including mounting plate. Other features are beryllium-copper armature and contact springs, spring reed-type armature hinge with low-reluctance gap, and, and high-permeability low-residual iron parts. Minimum input requirements are 20 milliwatts for d-c. types and 0.1 va. for a-c. types. Contacts are s-p.d-t. and will handle, with somewhat more than marginal input power, up to 15 amperes on low voltage d.c. or 1 kw. incandescent lamp load at 115 volts a.c.—*Sigma Instruments, Inc., 388 Trapelo Rd., Belmont, Mass.*

Please mention number 725 when filling out card

Cathode-ray Oscilloscope

New "CRU Oscilloscope" includes built-in power supply and input controls. A panel switch also permits use of built-in 60-cycle



sweep or external audio sweep for securing the familiar trapezoid pattern for modulation measurements. The 2AP-1A with a 2" screen and popular 6X5 rectifier are used. New oscilloscope is supplied in a table model but may be converted to rack model by addition of a rack panel. It is finished in black wrinkle. Because of its sensitivity, amateurs and experimenters will find the new instrument a valuable tool in adjustment of equipment, it is said. Oscilloscope is said to have proved serviceable under adverse climatic conditions.—*National Company, Inc., Malden, Mass.*

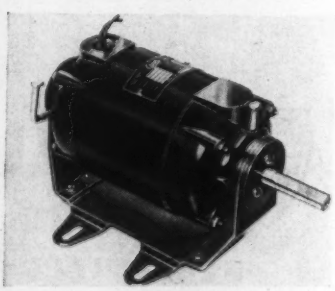
Please mention number 726 when filling out card

Capillary Pen for Recorders

New capillary pen for three-pen rectangular industrial recording instruments is a single tube type, its end in contact with instrument chart swaged to a smaller diameter, while capillary itself is less than half diameter of earlier design. A smaller tube minimum pen friction and smooth action even where instrument has a measuring system of extremely low actuating force. restricts ink flow, eliminating flooding. O. D. has been reduced to about half original size. Smaller area, combined with other constructional features, is said to contribute to *Brown Instrument Co., 4482 Wayne Ave., Philadelphia 44, Penna.*

Instrument Motor

New "Type KS-837 Ostermotor" is recommended for continuous-duty applications where quiet vibrationless operation and long



POSITION OPEN — EAST COAST MANUFACTURER

Design and Development Engineer. Must have had experience in design, development and manufacture of: (1) pressure elements including helical, spiral and Bourdon-tube, (2) all conventional temperature systems such as gas-filled, vapor pressure, mercury, etc., (3) mountings, pivots, etc. College graduate preferred but please supply all revelant details as to education, positions held, design achievements, etc.

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life are essential. It delivers up to 1/10 h.p. at 1725 r.p.m. It is a totally-enclosed split-phase induction, continuous-duty model, operating on 115 volts, a.c. Bronze sleeve bearings are grooved for best oil distribution and oversize felt oil retainers feed oil to shaft through two spring tension wicks at each bearing. Resilient neoprene mountings are not affected by oil or grease. Flange mounting is also available. Finished in black enamel. Length over bearings 8⅜", housing diameter 4²⁷⁄₆₄, weight 15 lbs.—*John Oster Mfg. Co., Racine, Wis.*

Please mention number 728 when filling out card

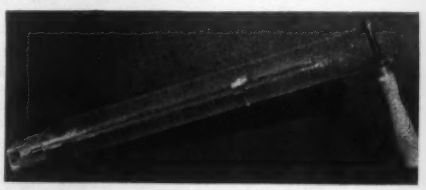
Hot Transformer Alarm

New "Thermalarm" gives a signal when a transformer is or has been operating above a predetermined limit. Housed in a Melmac plastic case, 3⅜" long by 1¹⁄₁₆" wide by 1¹⁄₁₆" deep, unit has a die-cast aluminum base which projects from back and acts as heat conductor. This case completely encloses a thermal element which controls a latch and releases a flag when safe operating temperature is exceeded. Spring-actuated flag, normally in downward position, flies up and presents a brilliant red surface large enough to be visible from ground level. Unit can be preset to actuate the latch at any point between 100°F. and 200°F. Device weighs 3 ozs., is reported as simple to apply, being held to transformer case by an adhesive.—*Eastern Specialty Co., 3617 North Eight St., Philadelphia 40, Pa.*

Please mention number 730 when filling out card

Wet- and Dry-bulb Psychrometer

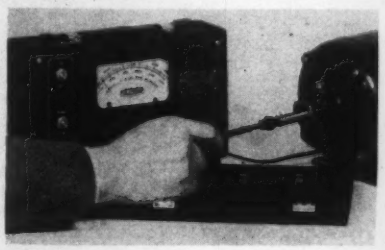
New "No. 1170" sling psychrometer utilizes wet- and dry-bulb principle and is whirled in usual manner, but its thermometers are enclosed in a transparent plastic tube which, it is said, "will usually withstand dropping." Whirling results in an air blast through tube, cooling wet bulb as rapidly as in an ordinary sling psychrometer.—*Laboratory Specialties, Inc., 144 South Wabash St., Wabash, Indiana.*



Please mention number 729 when filling out card

Synchronous-speed Tachometer

New Synchronous-speed Tachometer for 1800 and 3600 rpm. is available in three models as follows: "Type 48A" for speeds above synchronism (1700 to 2200 and 3400 to 4400 rpm.); "Type 48B" for speeds be-



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Shipments go everywhere at the speed of flight between principal U. S. towns and cities, with cost including special pick-up and delivery. Same-day delivery between many airport towns and cities. Fastest air-rail service to and from 23,000 off-airline communities in the United States. Service direct by air to and from scores of foreign countries in the world's best planes, giving the world's best service.

RATES CUT 22% SINCE 1943 (U. S. A.)

AIR MILES	2 lbs.	5 lbs.	25 lbs.	40 lbs.	Over 40 lbs. Cents per lb.
149	$1.00	$1.00	$1.00	$1.23	3.07c
349	1.02	1.18	2.30	3.68	9.21c
549	1.07	1.42	3.84	6.14	15.35c
1049	1.17	1.98	7.68	12.28	30.70c
2349	1.45	3.53	17.65	28.24	70.61c
Over 2350	1.47	3.68	18.42	29.47	73.68c

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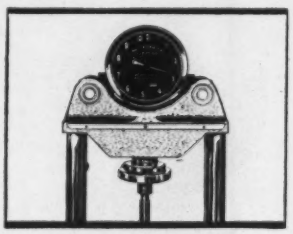
Portable Tester Checks Tensions Up To 10,000 lbs.— Right at the Workbench!

Standing only 37" high, weighing but 137 lbs., the Dillon Universal Tester checks wire, copper, aluminum, fabrics, steel, etc. for tensile, transverse, compression and shear strengths. Available in 7 capacities, with interchangeable dynamometers, the Universal will test from 0 to 10,000 lbs. Special gripping jaws are made for every requirement.

The Universal Tester may be either hand or motor operated. No special training is needed to record accurate results instantly on the dynamometer. It is compact, simple, inexpensive—designed for small shops and plants everywhere.

Tests prove that workers, too, undergo strain and nervous tension on the job. That's why many factories urge workers to chew gum. Workers can chew Wrigley's Spearmint Gum right on the job—even when hands are busy. And the act of chewing helps relieve monotony—helps keep workers alert, thus aiding them to do a better job with greater ease and safety.

You can get complete information from
W. C. Dillon & Company, Inc.
5410 W. Harrison St., Chicago 44, Illinois



Interchangeable Dynamometer

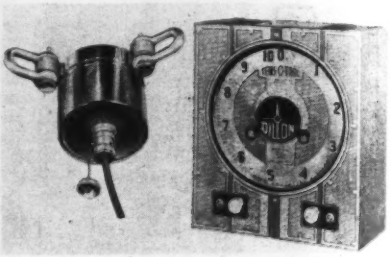
AA-78

low synchronism (1500 to 2000 and 3[illegible] to 4000 rpm.); "Type 48C" giving [illegible] spread above and below synchronism [illegible] to 2050 and 3100 to 4100 rpm.). [illegible] ranges are available on request. Instrument employs no flyballs or gears, no generator. Head is a contact-making mechanism (operated by rotation of spindle) periodically charging a capacitor through a d-c. milliammeter which indicates average current. Scales are exactly linear; accuracy is [illegible]. Dimensions: 10¼" long, 6¼" high, 4" deep; Weight: 8½ lbs. New tachometer requires an extremely low torque (0.25 ounce-inch) and therefore does not disturb the system being tested.—*Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.*

Please mention number 731 when filling out card

Remote-indicating Dynamometer

New "Tens-O-Trol System," electric remote tension and weight indicator, combines maker's dynamometer and highly-responsive

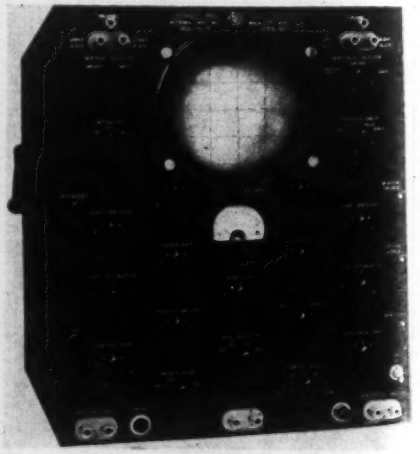


self-synchronous motors. Repeater stations are 12" wide, 14" high and 5" deep; weigh 10 lbs. Dial is 9½" diam. with 1" figures. Pressure beam in "Tens-O-Trol" requires a deflection of 0.04" for full 360° scale reading. When master transmitter deflects, repeater stations duplicate with an accuracy of 0.5% or better. System requires 12 volts d-c. for operation. Extreme temperature changes have no appreciable effect. All dynamometers can withstand a 100% overload and take a 25% overload without injury to calibration.—*W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill.*

Please mention number 732 when filling out card

General-purpose Oscilloscope

New "Model OL-15" five inch oscilloscope is said to incorporate latest circuits and to have been designed for versatility of operation, dependability, minimum weight and bulk, and faithful presentation of high-harmonic-content waves. Response curve of vertical amplifier is linear and without positive slope from 10 cps. to well over 4 Mc. and has transient response such that a 100-kc. square wave, with rates of rise and fall of the order of 400 volts per



WANTED: Instrumentation and Control Engineer to select and specify equipment for petroleum refineries. Knowledge of oil refinery practice and requirements essential. Mechanical or chemical engineering education and background desirable. Opportunity for advancement. Location, New York City. Box 112, Instruments Publishing Company, 1117 Wolfendale Street, Pittsburgh 12, Pa.

PROJECT PHYSICIST WANTED

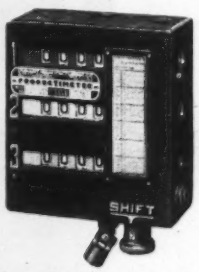
Graduate from an Accredited Engineering School with a major in Physics and Mathematics. Age limit 25-30. Must be capable of organizing and directing Research Projects. Write in full to Dept. "P", P. O. Box 420, Lancaster, Penna.

microsecond, is faithfully reproduced. Horizontal amplifier response extends linearly from 10 cps. to over 1 Mc. to accommodate any desired type of externally-generated sweep voltage. Sawtooth sweep range is from 5 cps. to 500 kc. with synchronizing sensitivity permitting synching and viewing 10-Mc. rf. sine waves. Triggered sweeps of 1, 4, 20, and 200 microseconds per inch may be inaugurated by the internal trigger generator or by external pulses. Sweeps and internally-generated trigger are phasable with respect to each other so that sweeps may be adjusted to occur before or after output triggers by varying degrees. These sweeps are also useful in viewing periodic phenomena of various types. Direct connections to all cathode-ray tube control elements can be made on front panel. Cast aluminum bezel over cathode-ray tube screen assists in preventing glare and provides convenient means of changing ruled masks, color filters and viewing aids. Total weight of instrument, including self-contained power supply, is less than 85 lbs. Dimensions: 15¾" × 12¾" × 19¼".—*Browning Laboratories, Inc., Winchester, Mass.*

Please mention number 733 when filling out card

Pick Counters

New two- and three-shift Pick Counters designed to meet varied requirements of mill men. A special feature is shutter mech-

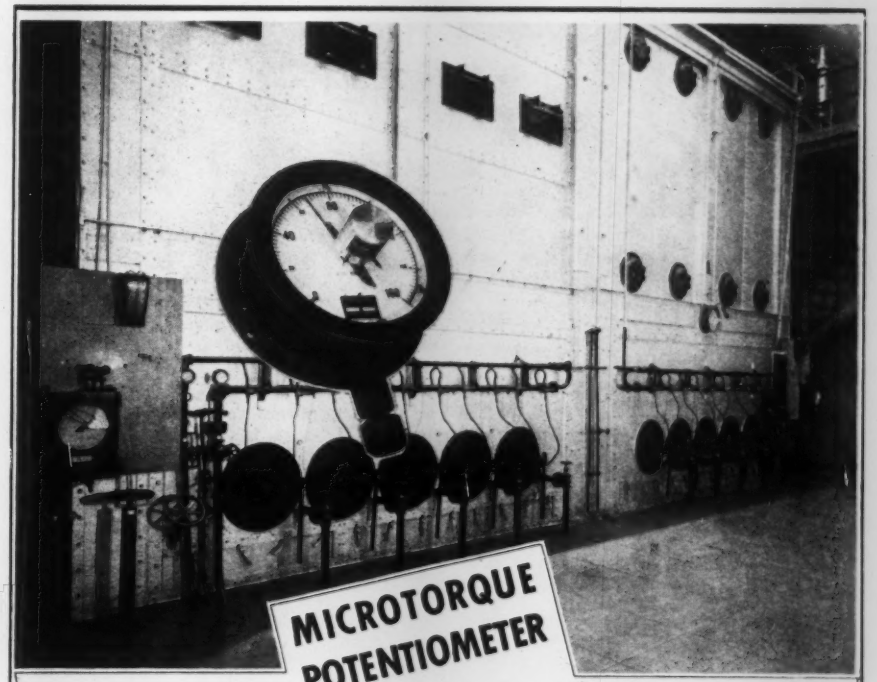


anism which positively prevents any falsification or "build up" of production figures. Any such attempt results in shutter closing and concealing figures. Other features: resettable from either side; center drive to fit any loom without special attachments; interchangeable for right or left-hand looms; shift knob made resettable or nonreset in three- and four-figures capacity; rustproof and dustproof.—*Durant Mfg. Co., 1914 N. Buffum Street, Milwaukee 1, Wisc.*

Please mention number 734 when filling out card

Time Counter and Automatic Timer

New "Type PTT-1 Precision Time Counter and Automatic Timer" is designed for accurate measurement and control of timed intervals and simultaneous operation of associated apparatus used in testing of engines, motors, or production machines. Time counter registers, in figures, time intervals up to 100 minutes (and repeat) to an accuracy of 0.001 minute. Operation is automatic for intervals of 0.1 minute and 1 minute; manual for any other period of time. Automatic operation for 0.1- and 1-minute intervals is obtained by means of a precision timer which starts and stops



MICROTORQUE POTENTIOMETER

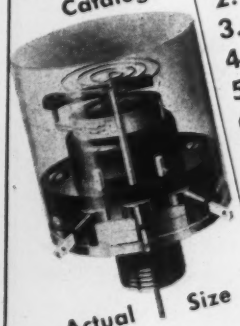
Hundreds of remote control and position repeating problems are greatly simplified by the adaptation of *AUTOFLIGHT's tiny, ultra-low torque variable resistance units.

Ideal for take-offs from low torque indicating meters by simple yoke adaptation to the instrument pointer, for take-offs from bellows elements used in temperature, pressure, or flow measurements, as primary control elements in bridge type circuits to operate directly recorder-controllers, recording galvanometers, oscillographs, and polarized relays.

Characterized by large electrical outputs with small mechanical inputs, the MICROTORQUE can be attached to sensitive movements without causing excessive drag.

FEATURES:
1. *Vibration-proof 4 to 55 cycles up to 6 G.*
2. *Resistance values 100 to 2500 ohms.*
3. *Input torque less than .003 oz in.*
4. *Power dissipation of 2 watts.*
5. *Linearity 1/2% or better.*
6. *Weight less than 3/4 oz.*
7. *Size 1" x 11/4"*

Write For New MICROTORQUE Catalog



Actual Size

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A Division of G. M. Giannini & Co., Inc.

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WHAT do you need in a PYROMETER ?

SENSITIVITY RESISTANCE
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Engelhard Direct Deflection Indicators have all these features . . . Accurate sensitivity to the most minute voltage variations due to suspension type construction . . . High resistance per millivolt and no appreciable error when used with thermocouples of different resistances and on connecting leads of considerable length . . . Sturdy construction, adapted to use under severe conditions without danger . . . So simple that instant readings may be made directly in either millivolts or temperatures by someone unfamiliar with the principles of pyrometry . . . On kilns or furnace installations, where "spot readings" are desirable—the Engelhard Rotary Switch permits separate readings from many points.

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WALL TYPE W-1

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WANTED

The Tennessee Valley Authority has vacancies for electrical laboratory technicians in its Electrical Laboratory and Test Division located in Chattanooga, Tennessee.

These positions are classified as Electrical Engineer I with an entrance salary of $2770 based on a 40-hour work week schedule with opportunity for within-grade increases and promotion.

Candidates must have experience in the repair and calibration of delicate electrical instruments including a thorough knowledge of electrical measurements.

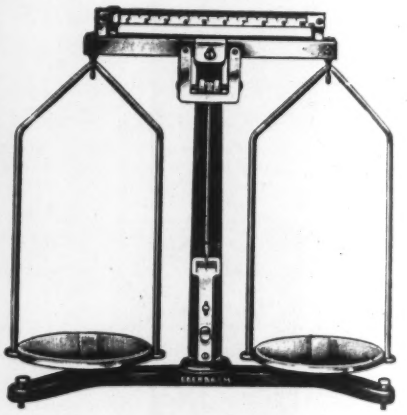
Interested persons should write the Personnel Department, Tennessee Valley Authority, Chattanooga, Tennessee.

the counter so nearly instantaneously that the interval is accurate to a few milliseconds. A double-pole double-throw relay is incorporated to operate fuel valves, revolution counters, recorders, motion-picture cameras or other devices simultaneously during the timed period. The time period may be created, accurately measured, and transmitted to other apparatus, or it may be received from other apparatus and measured by the time counter. Instrument requires a minimum of 10 watts of accurately-controlled 60-cycle frequency power and a total wattage of 40 to 45. Dimensions of front panel are 5½" × 8"; weight of instrument approx. 15 lbs.—*The Electric Tachometer Corp., Broad and Spring Garden Sts., Philadelphia 23, Penna.*

Please mention number 735 when filling out card

Laboratory Balance

New "Model A 3-770 Utility Laboratory Balance" is designed for weighing bulky samples where a capacity of 2 kg. and an

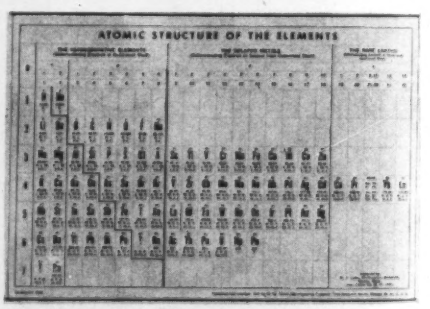


accuracy of 0.1 g. are required. It is designed for heavy duty without decreasing sensitivity. Beam is a departure from conventional type in that it combines rigidity with protection of knife edges and bearings from dust and mechanical injury. Beam has a single sliding weight and fixed scale, graduated to 10 g. in 0.1 g. subdivisions, eliminating use of weights smaller than 1 g. Bearings are agate; pans are 14 cm. in diameter of nickel-plated brass. Total height 42 cm. Pans are slightly concave; bows are 15 cm. wide and 30 cm. high. —*Eberbach & Sons Co., Ann Arbor, Mich.*

Please mention number 736 when filling out card

Atom-structure Wall Chart

New chart of atomic structure of the elements is based upon concept of the "differentiating electron." It was compiled

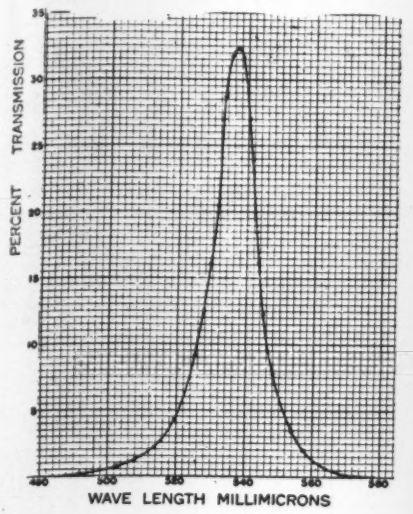


by Professor W. F. Luder of Northeastern and was written up in *Journal of Chemical Education*, Vol. 20, 1943, page 21. Chart is printed in 3 differentiating colors on heavy reinforced chart stock 42"x58", with double split rollers at top and bottom. It includes the two new artificial elements, Np and Pu. —*W. M. Welch Mfg. Co., 1515 Sedgwick St., Chicago 10, Illinois.*

Please mention number 737 when filling out card

Interference Type Optical Filters

New "Farrand Interference Type Filters" are available in the spectral range from 350 to 1200 millimicrons in 50 mm. squares and



in three series. "Series I" comprise filters offered individually or in sets spaced in 25 mμ. peak transmission intervals and isolate band widths of 15 mμ. "Series II" comprise line source filters; "Series III" comprise "Standardized" filters with exceptionally close tolerance ± 3 mμ at peak transmission and supplied for any wave band isolation desired by the user within the present available spectral range from 350 to 1200 mμ.—*Farrand Optical Co., Inc., Bronx Blvd. and E. 238th St., New York 66, N. Y.*

Please mention number 738 when filling out card

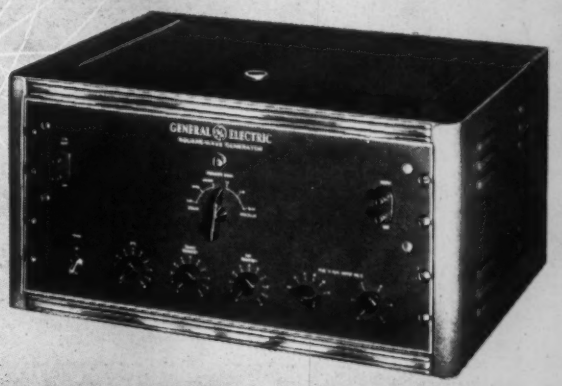
Dial Type Thermometer

New all-metal dial-type thermometer for indicating temperatures from 100°F. to 950°F. is provided with a slip-on handle

which protects operator's hand when instrument is in portable use. Handle can be easily detached when instrument is to be permanently mounted. Features include all-metal construction which gives maximum protection against vibration, shock, and rough handling; precision bi-metallic temperature element which has no pivots, mechanical linkages, or gears and is stated to provide sustained accuracy within 1% of scale range; designed to withstand momentary over-scale temperatures within 10% of scale range. Made with corrosion-proof stainless steel stem 3/16" O.D. and 5" free length, with only 2" immersion required to obtain accurate readings. Also available with ⅜" O.D. stem having 9" free length.—*Bacharach Industrial Instrument Company, 7000 Bennett Street, Pittsburgh 8, Pa.*

Please mention number 739 when filling out card

To test over-all performance



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● This unit, generating its own frequency or synchronized from an external source, will be found invaluable in many fields. FM, AM and Television Broadcasting—Telephone and Telegraph Communications—Manufacture of Transmitting and Receiving Equipment and Parts.

● Many additional functions will recommend it for use in school and college research projects and in scientific laboratories.

• • •

For additional information write: *Electronics Department, General Electric Company, Syracuse, New York.*

Electronic Measuring Instruments

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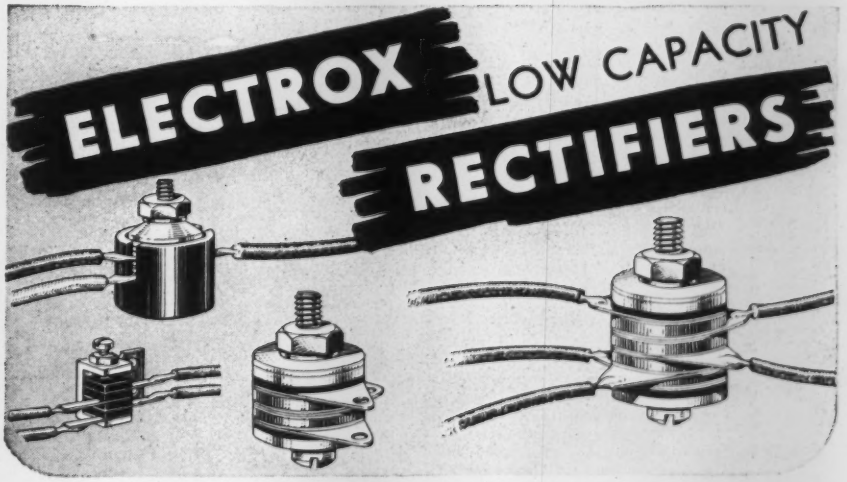
ELECTROX LOW CAPACITY RECTIFIERS



For dependable, trouble-free service in test sets, instruments, and similar electronic applications, use Electrox Rectifiers, made by one of the oldest manufacturers of dry disk rectifiers. Finest quality, full and half wave low capacity copper oxide rectifier units; each unit inspected, tested, guaranteed right. Ask your parts supplier for Electrox Rectifiers. If he cannot yet supply you, send us his name and ask for descriptive Bulletin 446.

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SOCIETY OF AMERICA

National Instrument Conference and Exhibit

Over 1500 instrument men and engineers are expected to attend the First National Instrument Conference and Exhibit of The Instrument Society of America, which will be held in the Wm. Penn Hotel, Pittsburgh. September 16-20, 1946.

Albert Sperry, President of the Instrument Society of America, in urging attendance at the "Instrumentation for Tomorrow" Conference and Exhibit, pointed out that now is the time to make plans for the long-awaited day when industry will resume production free from all restrictions.

The General Chairman of the Conference, R. J. S. Pigott, has arranged a very interesting program consisting of 15 sessions covering the following subjects: Measurement and Automatic Control in Industry, Plant Instrument Department Practices, Inspection and Gaging, Scientific Measurements, Research in Instrumentation, Physical Testing, etc.

Paul Exline, Chairman of the Exhibit Committee, advised that up to July 1st, 95 manufacturers had made reservations and advised that they plan to show many new and improved instruments and controls perfected during the war.

INDIANAPOLIS

The regular meeting of the Indianapolis Technical Instrument Society was held June 4, 1946, at Purdue University Center.

Mr. D. O. Kocmich, of the Trimount Instrument Co., Chicago, gave a very fine talk on "New Electronic Instruments." He gave the circuit for an inductance bridge and the associated equipment to either indicate or record the degree of unbalance of the bridge. He described and showed a variety of pick-ups for the measurements of strain, pressure, etc.

—MORRIS UNDERWOOD, *Sec'y-Treas.*

LOS ANGELES

A very interesting meeting was held on June 4th by the California Section. A brief business meeting was held during which, Past President Wm. (Bill) Warren was elected as our member of the national Board of Directors.

Mr. Harry A. Fore, president of The Goldak Co., of Glendale, Calif gave a detailed talk on "Electronic Devices for Locating and Tracing Underground Pipes." His talk also touched on metal detectors, mine locators and other similar devices. Mr. Fore had a unique demonstrating unit.

—M. D. PUGH, *Sec'y*

NEWARK

The members of the New Jersey Section were guests of the Standard Oil Company's (N. J.) Bayway refinery on May 4th. A group of 85 visited the Company's aviation engine fuel test stand and inspected the full scale operation of a 1350-hp. engine.

The trip was conducted in two phases in which the group first inspected the test cell, engine and instrument control room. The engine was put through its paces and all the facilities were described by Mr. O. G. Lewis who is in charge.

Upon completion of the inspection trip, the group then assembled to have Mr. G. A. Martin explain the instrumentation for the cell. The amount of design and other work can be inferred from the fact that the instruments chart some 500 readings.

We are sure this meeting will go down as one of the highlights of the current season. We're for more inspection trips if they can be as well handled as this one.

—H. S. CLOSE, *Secretary*

NEW YORK

The New York Section, I.S.A., held its monthly meeting on June 17, 1946 at the Men's Faculty Club, Columbia University. Forty members and guests were present for dinner with eight additional members arriving later for the meeting.

Prof. C. F. Kayan, Section President, opened the meeting at 8:00. The Treasurer, E. E. Corbett, read a well prepared semi-annual report; and Vice President, H. L. Hildenbrand reported on the preliminary draft of by-laws for the Section.

President Kayan then introduced the speaker for the evening, Mr. A. L. Chaplin of the American Cyanamid Company, who gave a very interesting paper entitled "Some Problems Affecting Instrumentation in the Chemical Processing Industries." Mr. Chaplin explained the essential differences between batch and continuous methods of processing, mentioning where each was best suited as well as pointing out what type of measurements were needed in each case and where automatic control could be used to an advantage to obtain a uniform standard product. He also pointed out the necessity for the instrument engineer to help in the plant lay-out in order that the instrumentation may be integrated with the plant.

—CHARLES DANA COREY, *Sec'y*

NORTHERN INDIANA

The Northern Indiana Section of the I.S.A., held its May meeting on the evening of May 24 at the Lake Hotel in Gary, Indiana. Our original May meeting, scheduled for the 15th, was called off due to the inability of the speaker to appear at that time.

We were fortunate to get Mr. Albert F. Sperry to come out from Chicago and give us a good talk on the I.S.A. Mr. Sperry is President pro tem of the I.S.A., so we would have had difficulty in finding a more informed speaker on that subject. His talk dealt mainly with the structure of the I.S.A. and the purposes of each part of the structure. He also told us about the meeting at Detroit where much good work was done toward getting the organization rolling. He described in detail the Educational program, the Advisory Council of Instrument Users, the Standardization Committee, and the Instrument Manufacturers' Advisory Committee. His description of the coming exhibit in Pittsburgh, was heartening.

Mr. Sperry spoke quite informally and had our group relaxed in a very few minutes. When he was finished he left us with the warm feeling that we are a part of an important nation-wide organization, which the industry of this country needs urgently if it is to keep ahead in the technical world; an organization which is definitely on solid ground now and starting on the achievement of the purposes laid down in its constitution and by-laws.

—EDWARD WHITE, *Publicity Committeeman*

WAYNE COUNTY

At the June meeting of the Wayne County Section, Mr. Herb Barnum, formerly of Minneapolis-Honeywell, brought an electronic micrometer and gave a blackboard talk explaining its construction and circuits. This micrometer is sensitive to twenty-five millionths of an inch. It operates without perceptible pressure on the article being measured. Mr. Barnum then showed us the circuits and operation of a new electronic timer for fixing duration and frequency of electrical impulses.

The talk was concluded by a little chat on "Human Engineering." We learned some uncomfortable facts about nervous tension and mental breakdowns. There were some suggestions as to what should be done at home, and by the sufferer, and by employers, to make relaxation more beneficial.

—JOHN MAC PHERSON

Other Societies

KALAMAZOO

The Southern Michigan Instrument Society held its June 12 meeting in Galesburg, Michigan. Following the dinner, Mr. E. B. Bossart of the Bailey Meter Co. gave an illustrated lecture of the value of Coordinated Control in a Steam Power Plant. Mr. Bossart was introduced by Mr. Fred Brydges, of General Foods Corporation of Battle Creek, Michigan.

The meeting was attended by 32 men and 7 women.—KEN MEAD, *Executive Secretary*

SOUTH TEXAS

The regular meeting of the South Texas Instrument Society was held 11 June 1946 at the Central Power & Light Company's Meter & Repair Shop in Corpus Christi.

Mr. T. M. Hunt, First Vice President, presided in the absence of President B. F. Heye. Mr. J. B. McMahon of Republic Flow Meters Company gave a short talk on the National Instrument Society.

A very good amateur ventriloquist followed. The actors were Donald Duck and 10-year old Russell Schockler.

The history and organization of the Central Power & Light Company's meter testing and repair department were outlined by Mr. Floyd Salmons, and then Mr. M. D. Jester explained the "innards" and operation of electric meters of various kinds.

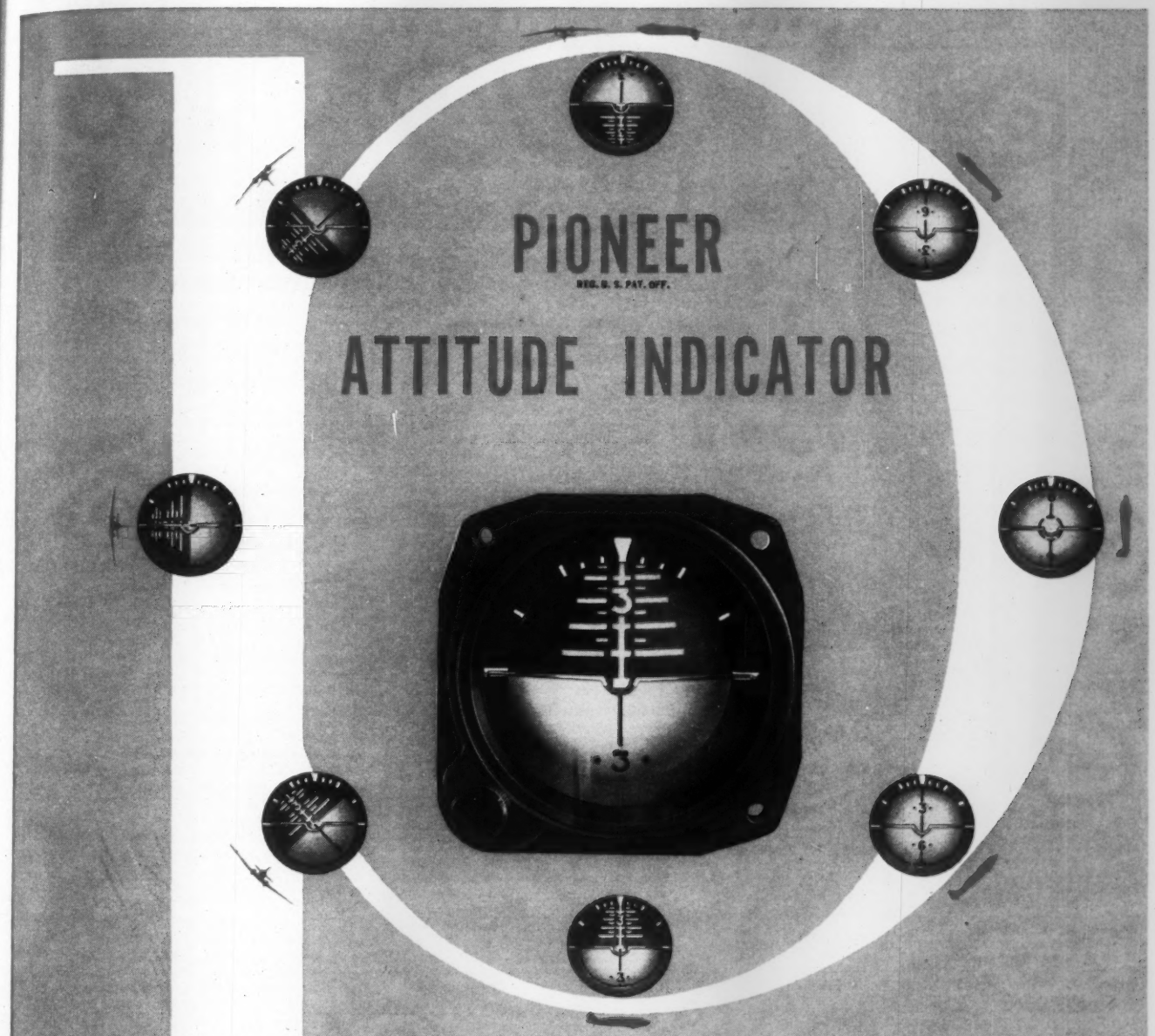
After Mr. Jester's talk, those present toured the shop in small groups and saw all phases of repair and testing of meters.

Refreshments were served to 35 members and 5 guests.

June 16, Father's Day, the South Texas Instrument Society held a barbecue at the La Gloria Corporation Cycling Plant near Falfurrias, Texas.

An excellent meal of barbecued beef, beans, fresh tomatoes, and watermelon was served to sixty members, wives, children and guests. All present extended thanks to J. P. Nielsen, Chester Wheless, and R. E. Denmead for the work they did in producing a first rate "outing."

After a short talk on the question of a cycling plant and the products produced, such as propane, butane, and gasoline, by Secretary Givens, a tour of the plant was conducted by J. P. Nielsen and Secretary Givens. —HOMER C. GIVENS, *Secretary*



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I. S. A. SECTIONS

City, Section, and Secretary	Date and Place	Subject and Speaker
Baltimore, Md.; Baltimore Section, I.S.A., F. Ragan, Fuel Div., Beth. Steel, Sparrows Pt., Md.		
Charleston, W. Va.; Charleston Section, I.S.A.; M. B. Lorig, 1506 Virginia St., Charleston 1		
Chicago, Ill.; Chicago Section, I.S.A.; A. J. Butler, c/o IHC, 2626 W. 31st Blvd., Chicago		
Cleveland, Ohio; Cleveland Section, I.S.A.; A. J. McCullough, Minneapolis-Honeywell, 5005 Euclid Ave., Cleveland 3		
Cumberland, Md.; Cumberland Section, I.S.A.; Carl Lower, LaVale Rt. 1, Cumberland, Md.		
Detroit, Mich.; Detroit Section, I.S.A.; J. D. McCullough, Horace H. Rackham Bldg., 100 Farnsworth, Detroit 2		
Gulf Coast (Tex.); Gulf Coast Section, I.S.A.; O. D. Sanders, Neches Butane Co., Port Neches, Texas		
Kansas City, Mo.; Kansas City Section, I.S.A.; O. L. Boutros, 1627 E. 31st St., Kansas City 3, Kansas	**Sept. 10**(B), Main Auditorium, Univ. of K. C.	"Fundamentals of Pyrometry," W. H. Steinkamp, Brown Inst. Co.
Los Angeles, Calif.; California Section, I.S.A.; M. D. Pugh, 35 S. Raymond Ave., Pasadena 1		
Newark N. J.; New Jersey Section, I.S.A.; H. S. Close, 831 Dixie La., Plainfield, N. J.	**Oct. 1**(B), Essex House	"Shop and Equipment Requirements for an Instrument Dept. in a Large Plant in the Process Industry," W. Fortney, Humble Oil & Refining Co.
New Orleans, La.; New Orleans Section, I.S.A.; W. H. Haney, 1016 Esplanade Ave., New Orleans		
New York, N. Y.; New York Section, I.S.A.; C. D. Corey, Rieber Research Lab., 127 E. 73rd Street, New York 21		
N. Indiana; North Indiana Section, I.S.A.; C. P. Haynes, Red River Oil Ref., 935 177th Pl., Hammond, Ind.		
Philadelphia, Pa.; Philadelphia Section, I.S.A.; Clarence W. Wood, Mason-Neilan, 6908 Market St., Upper Darby, Pa.		
Pittsburgh, Pa.; Pittsburgh Section, I.S.A.; L. M. Susany, c/o Carnegie Institute, 4400 Forbes St.	**Oct. 28**(B), Roosevelt Hotel	"Manometer Applications in Industry," A. A. Hejduk, Meriam Instr. Co.
St. Louis, Mo.; Saint Louis Section, I.S.A.; H. E. Zeffren, 5625 Enright Blvd., St. Louis 12		
Kingsport, Tenn.; Tennessee Section, I.S.A.; C. F. Palmer, 2924 J. C. Hwy., Kingsport		
Toronto, Ont., Canada; Ontario Section, I.S.A.; T. C. Agnew, Minneapolis-Honeywell		
Washington, D. C.; Washington Section, I.S.A.; G. M. Rolls, c/o American Instrument Co., 8010-8020 Georgia Ave., Silver Springs, Md.		
Wyandotte, Mich.; Wayne County Section, I.S.A.; Chas. Chessrown, P. O. Box 150, Wyandotte	**July 22**, Wyandotte Chemicals Corp.	Conducted trip through dry ice department.

OTHER SOCIETIES

(Events of which *Instruments* has been notified.

City, Society, and Secretary	Date and Place	Subject and Speaker
Akron, Ohio; The Akron Instrument Society; Fred Appel, Jr., 932 Columbia Court, Barberton, Ohio.		
Atlanta, Ga.; Georgia Society for Measurement and Control; John Roberts, 439 Deering Rd.		
Ft. Worth, Tex.; Ft. Worth Electronics Club; W. H. Farrington		
Hartford, Conn.; Hartford Society for Measurement & Control; Gustave L. Manke, c/o Veeder-Root, Sargent & Garden Sts.		
Houston, Tex.; Houston Instrument Society; R. W. Fritsche, 630 A M & M Bldg., Houston 2		
Indianapolis, Ind.; Indianapolis Technical Instrument Society; Morris Underwood, Indianapolis Power & Light Co., Indianapolis 6		
Kalamazoo, Mich.; Southern Michigan Instrument Society; F. R. Brydges, 223 Chestnut St., Battle Creek.		
Los Angeles; Southern California Meter Association; Charles Meriam, Publicity Chairman, 960 Mission St., South Pasadena, Calif.		
Sarnia, Ont., Canada; Sarnia Instrument Association; K. Williamson, 168 Cobden St., Sarnia		
Southwest Texas; South Texas Instrument Society; Homer C. Givens, LaGloria Corp., Falfurrias, Tex.		
Whiting, Ind.; Whiting Instrument Men's Guild; Fred T. Lucas, 1713 Myrtle Ave., Whiting, Ind.		

(A)Meeting at 7:30, no dinner (B)Dinner at 6:30, meeting at 8 (C)Dinner at 7, meeting at 8 (D)Meeting at 8, no dinner (E)Dinner at 6:30, meeting at 7:30

Manufacturers' New Literature

In this department we report new literature pertaining to Instrumentation, received from the manufacturers. We urge readers to request ONLY those bulletins which will be of value to them. Use the Postage-free Order Card on page 443.

N-249 **Open-channel Meters.** 10-page 8″ × 10½″ Bulletin 62 illustrates and describes open-channel meters for sewage, industrial wastes, sludge, water supply, irrigation and liquids with solids in suspension. Operating data, charts and diagrams are included. Bailey Meter Co., Cleveland 10, Ohio.

N-250 **"Aminco Laboratory News."** 12-page 8½″ × 11″ Vol. 3, No. 1 of this house organ carries bits of news, technical information and illustrates and describes various instruments and laboratory equipment. Recent technical papers and new inventions are covered. American Instrument Co., Silver Spring, Md.

N-251 **Round-chart Potentiometers.** 16-page 8″ × 10½″ Catalog 15-5 illustrates and describes the "Brown Electronik Continuous Balance Potentiometer" with circular chart for recording and controlling. Instrument is said to be unaffected by vibration, can be positioned at any angle. Brown Instrument Co. Div. of Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.

N-252 **Non-destructive Testing.** 4-page 8½″ × 11″ Bulletin 3000 illustrates and describes the "Sperry Supersonic Reflectoscope" which sends supersonic vibrations through material under test and measures length of time for reflecting from opposite side or from an internal defect. Sperry Products Inc., Hoboken, N. J.

N-253 **Precision Drill Press.** 4-page 8½″ × 11″ bulletin illustrates and describes a high-speed precision drill press designed exclusively for small-hole work in instrument departments, etc. Governor maintains exact spindle speed, with coarse or micro-feed. Electro-Mechano Co., 261 East Erie St., Milwaukee 2, Wisconsin.

N-254 **Ultra-high-frequency Vacuum Thermocouples.** 4-page 3½″ × 8½″ Bulletin V23 illustrates and describes small vacuum thermocouples for measuring current or voltage at ultra-high frequencies. It is said that only four seconds elapse between applications of heater current and full output from couple. Field Electrical Instrument Co., 109 E. 84th St., New York 53, N. Y.

N-255 **Tungsten-carbide Gage Blocks.** 8½″ × 11″ Data Sheet TC-1 describes 82-piece set of tungsten carbide gage blocks in sizes 0.050″ to 4.000″, said to be 100 times more resistant to abrasion than steel and to surpass Bureau of Standards requirements. Fonda Gage Co., 53 Daly St., Stamford, Conn.

N-256 **"The Hydromike."** 4-page 8½″ × 11″ Issue No. 26 of this house organ illustrates and describes snow-rain recorders: "Type W," 100″ capacity which operates a year and "Series Q" which operates 64 days without attention. The "Type W" recorder can be supplied with radio transmission facilities for broadcast of precipitation catch at stated intervals. Featured is an article entitled "Man and Atoms." Leupold and Stevens Instruments, 4445 N. E. Glisan St., Portland 13, Ore.

N-257 **Indicator Light Assemblies.** 26-page 8½″ × 11″ Catalog No. 46 illustrates and describes what is said to be the largest selection of Underwriters' approved indicator light assemblies for panel board and instrument signaling, for any voltage and style of miniature lamp. Included are built-in resistor assemblies for neon lamps, brackets, accessories and diagrams with essential dimensions and other data. Gothard Manufacturing Co., 2110 Clear Lake Ave., Springfield, Ill.

N-258 **Protected Sling Psychrometer.** Single sheet 8½″ × 11″ pictures and describes a protected sling psychrometer with thermometers enclosed in plastic tube: when unit is whirled, centrifugal force creates a blast of air through the tube from center of rotation to free end of tube. Laboratory Specialties Inc., 144 So. Wabash St., Wabash, Ind.

N-259 **Low-capacity Rectifiers.** 4-page 8½″ × 11″ Bulletin No. 446 illustrates and describes a group of low-capacity copper-oxide rectifiers, square- and round-disk, full- and half-wave, d-c. output 5 to 50 milliamperes for instruments, test sets, and similar applications. Schauer Machine Co., 2060 Reading Road, Cincinnati 2, Ohio.

N-260 **"Weather Simulator."** 6-page 4″ × 9″ folder illustrates and describes cabinet said to be able to reproduce extreme climatic and weather conditions. Also covered are electric furnaces, drying ovens and constant temperature baths. The Electric Hotpack Co., Inc., 1225 Cottman St., Fox Chase, Philadelphia 11, Pa.

N-261 **Vibration Fatigue Testing Machine.** 4-page 8½″ × 11″ Bulletin 1007 illustrates and describes "Model 100VA" vertical vibration testing machine designed to handle loads to 100 lbs., equipped with automatic acceleration-changing feature, which starts with a frequency of 10 c.p.s., accelerates to 55 and decelerates to 10, every minute indefinitely unless interrupted. Other models are also covered. All American Tool and Mfg. Co., 1014 Fullerton Ave., Chicago 14, Ill.

N-262 **Voltage Regulator.** 4-page 8½″ × 11″ Bulletin No. 171-01 illustrates and describes "Type TH-2½A Transtat Alternating Current Voltage Regulator," continuously-adjustable from zero to above line voltage, adjusting potential to a load from an a-c. line and permitting control in small increments over wide range of voltages without opening circuit. American Transformer Co., 178 Emmet St., Newark 5, N. J.

N-263 **Potentiometer Air-operated Controller.** 16-page 8″ × 10″ Bulletin 15-4R illustrates and describes the "ElectroniK" circular chart potentiometer air-operated controller said to be the only potentiometer-type instrument in which the air control flapper mechanism is instantly positioned in response to temperature change and at no other time are operating parts in motion. Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.

BRADLEY

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Unmounted Cells

The shapes of Luxtron photocells vary from circles to squares, with every in-between shape desired. Their sizes range from very small to the largest required.

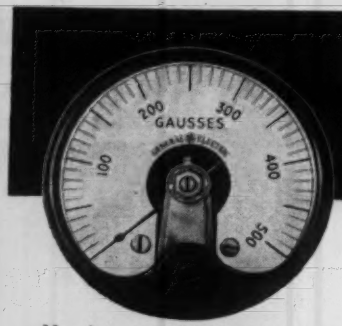
In addition to the unmounted cells shown here, Bradley also offers cells in a variety of standard mountings, including plug-in and pigtail types.

For direct conversion of light into electric energy, specify Bradley's photocells. They are rugged, lightweight and true-to-rating.

Illustrated literature, available on request, shows more models of Bradley photocells, plus a line of copper oxide and selenium rectifiers. Write for "The Bradley Line."

BRADLEY LABORATORIES, INC.

82 Meadow St. New Haven 10, Conn.



GAUSS meter

The Only Instrument That Gives DIRECT MEASUREMENT OF MAGNETIC FLUX

Here is a new miniature magnetometer designed for ready measurement of the density and direction of flux in permanent magnets and d-c electromagnets—suitable for laboratory and shop use, for research and development, or production-testing of magnets.

Applications in which the gauss meter has been found useful are: checking flux density and distribution in electric-instrument magnets; checking flux density in arc blowout chutes, in contactor blowouts, and in voltage regulators; studying flux patterns about irregular-shaped magnets.

LIGHTWEIGHT—EXTREMELY EASY TO USE—INEXPENSIVE

This compact instrument can be held in one hand; for flux measurement there is probably no easier instrument to handle and operate. Its tiny prod, with a small area of sensitivity, enables the flux to be measured at what amounts to a single point in the air gap or iron structure—making possible a detailed analysis of flux distribution in any magnetic system. Since it does not depend upon voltages induced in a movable search coil, it is easier to use than the ballistic-type fluxmeter and permits more thorough investigation of magnetic structures. Write for leaflet GEA-4545. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

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RUBICON "SPOTLIGHT" GALVANOMETERS

RUBICON MULTIPLE REFLECTION GALVANOMETERS are available with sensitivities as high as 5×10^{-10} amp. or 1×10^{-6} volt per mm. scale division and with periods as short as 1 second. The scales are 100 mm. long and are remarkably proportional.

Hundreds of these sturdy self-contained galvanometers are in daily use in leading educational and industrial establishments for precision measurements by both the null and the deflection methods. Write for Bulletin 320 for complete description.

RUBICON COMPANY

ELECTRICAL INSTRUMENT MAKERS

Ridge Ave. at 35th St., Philadelphia 32, Pa.

N-264 **96% Silica Glass.** 4-page [illegible] 11" Bulletin EL-Z-Z11 illustrates and describes "Corning Vycor No. 79-96% Silica Glass" available in tubing, rod, sheet, coil forms, cylinder and [illegible] laneous forms. Corning Glass Works, Corning, N. Y.

N-265 **Combustibles Recorder.** 4-page 7¾" × 10½" Bulletin 150 illustrates and describes an instrument giving a continuous record of combustibles content of a gaseous mixture, for controlled-atmosphere producers, controlled-atmosphere furnaces, chemical processes, boiler furnaces, and internal-combustion engine testing. Bailey Meter Co., Cleveland 10, Ohio.

N-266 **Radio and Electronic Equipment Buying Guide.** 114-page 6[illegible]" × 9½" Catalog No. 111 illustrates, lists and describes complete line of radio and electronic supplies. All equipment is presented in organized sections with items indexed for easy reference. Allied Radio Corp., 833 W. Jackson Blvd., Chicago 7, Ill.

N-267 **Water Level Control at Parkchester.** 8-page 8½" × 11" Bulletin 451 illustrates and describes the use of "Copes Flowmatic Regulators" on boilers which heat the world's largest housing project. Northern Equipment Co., Erie, Pa.

N-268 **Vibration Damper.** 8-page 8½" × 11" Bulletin No. BU50 illustrates and describes "Rubber-in-Shear Vibrating Dampner and Precision Leveler" machinery mounting, designed to stop transmission of vibration as well as to provide a means of leveling the machines. Bushings, Inc., Coolidge and 14 Mile Rd., Royal Oak, Mich.

N-269 **Multiple-circuit Switches.** 12-page 8½" × 11" Catalog No. 200 pictures and describes "Master" switches which, in combinations of thirty standard arrangements, are said to offer unlimited contact possibilities for opening and closing circuits, stopping and starting automatic machine cycles, lighting, actuating relays, valves, etc. General Control Co., 1200 Soldiers Field Rd., Boston 34, Mass.

N-270 **Interference Viewer.** 6-page 8½" × 11" folder illustrates and describes the "Optron" interference viewer for optical interference measurements. The surface being examined, either for flatness or for size, is both illuminated and viewed perpendicularly, thereby eliminating errors from angular distortion. The Optron Laboratory, 2655 Salem Ave., Dayton 6, Ohio.

N-271 **Comparison and Limit Bridge.** 4-page 8½" × 11" folder illustrates and describes "No. 1010 Comparison and Limit Bridge" for both precision testing and production inspection of resistors, capacitors and inductors. Freed Transformer Co., 72 Spring St., New York 12, N. Y.

N-272 **Combustion Controller.** 4-page 8½" × 11" bulletin pictures and describes "Type D636 Combustion Control," a hydro-electronic controller for continuous proportioning of fuel and air to steam demand. It is designed to function from either steam pressure or combination of steam pressure and steam flow. Shallcross Controls Inc., Milwaukee, Wis.

N-273 **Rate-of-flow Indicator.** 2-page 8½" × 11" Bulletin 360 illustrates and describes "Model FGG Flo-Gage," a midget rate-of-flow indicator for water, steam, air or gases through lines containing orifices, or other differential producers. Also for indicating liquid level and pressure differences. Builders-Providence, Inc., Providence 1, R. I.

N-274 **Radio Testing Equipment.** 4-page 8½" × 11" Bulletin F-13 pictures and fully describes dynamic and output tube testers, capacitor tester, test oscillators, a-c., d-c. electronic multimeters, industrial circuit testers, audio oscillators and cathode-ray oscillographs. Jackson Electrical Instrument Co., 18 South Patterson Blvd., Dayton 1, Ohio.

N-275 **Pressure-operated Switches.** 8-page 8½" × 11" bulletin illustrates and describes pressure-operated switches said to provide uniform pressure control from 30" of vacuum to 5000 lbs./in.² for aircraft, industrial and marine use in gas, steam, oxygen, or oil systems. Meletron Corp., 950 North Highland Ave., Los Angeles 38, Calif.

N-276 **Feed Water Control System for World's Largest Forced-circulation Boiler.** 16-page 8½" × 11" Bulletin 447 pictures and describes the use of "Copes" controllers and valves on world's largest forced-circulation boiler, at Somerset Station of Montaup Electric Co., Fall River, Mass. Northern Equipment Co., Erie, Pa.

N-277 **Pipe Locator.** 6-page 6" × 9" folder illustrates and describes with complete operating instructions the "Wahlquist Model 112" pipe locator consisting of a transmitter and a receiver. Transmitting oscillator remains stationary; receiver delivers amplified output to headphones. Nilsson Electrical Laboratory, Inc., 103 Lafayette St., New York 13, N. Y.

N-278 **Magnified Fluorescent Lighting.** 8-page 5½" × 8½" folder illustrates and describes the "Magnalite," a visual aid designed for doctors, dentists, first aid rooms, hospitals and inspection rooms. Two fluorescent tubes are mounted in a plastic head provided with a 5" magnifier, assembly mounted on a counterbalanced arm and self-supporting in any position. The Haas Corporation, Mendon, Michigan.

N-279 **Gravity Convection Ovens.** 6-page 8½" × 11" bulletin pictures and describes "Elconap" hot-air ovens with directed circulation of air currents. Temperature range of 180°C. makes units usable as ovens or hot-air sterilizers. Electric Heat Control Apparatus Co., Newark, N. J.

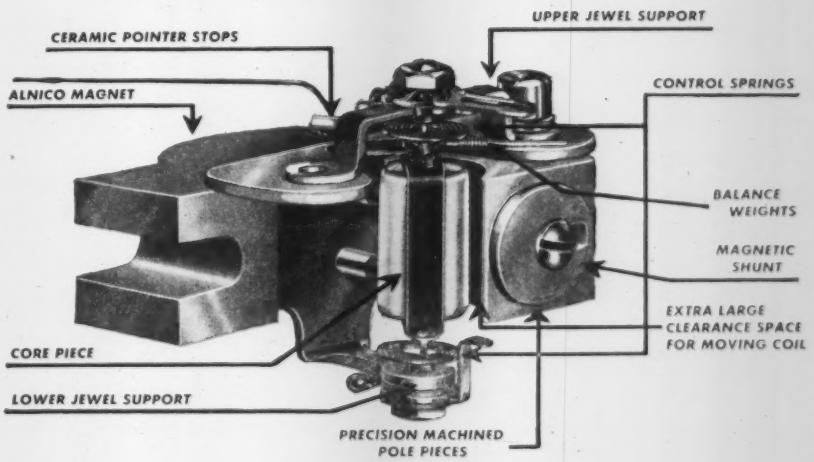
N-280 **Manually-operated Switches.** 8-page 8½" × 11" Catalog No. 100 illustrates and describes manually-operated switches for hand, elbow, knee or foot operation. Hand switches are of the "press anywhere" type; foot models are angled and flush-with-floor type, with or without guards. General Control Co., 1200 Soldiers Field Road, Boston 34, Mass.

N-281 **Dairy Thermometers.** 6-page 8" × 10½" Bulletin T825 illustrates and describes thermometers for the dairy industry for recording pasteurizing, sterilizing, cooling and holding temperatures. Water-proof case, corrosion-resisting sanitary construction meets all state and federal Health Department requirements. The Bristol Co., Waterbury 91, Conn.

N-282 **Open-hearth Immersion Pyrometer.** 4-page 7¾" × 10½" Folder N-33B illustrates and describes "Immersion Rayotube Pyrometer" consisting of four parts: an immersion tube with enclosed radiation-sensitive device sighting through an orifice at immersed end; an air control unit for controlling airstream which keeps immersion tube clear of molten metal and slag; a "Speedomax" recorder; and a checking unit. It is said that O-H temperatures are easily taken in less than two minutes. Leeds & Northrup Co., 4908 Stenton Ave., Philadelphia 44, Pa.

N-283 **Automatic Draft Control.** Single sheet 8½" × 11" Bulletin No. L-148-A illustrates and describes a furnace draft controller which opens damper before stoker can operate and closes damper when stoker operation is stopped. Draft switch is sensitive to 0.01" of water. Shallcross Controls, Inc., Milwaukee, Wis.

N-284 **Boiler Feed Water Regulators.** 8-page 7¾" × 10½" Bulletin No. 83-C describes and illustrates the "Thermo-Hydraulic Feed Water Regulators" which may be installed any place in the boiler feed line, above or below boiler water level, no piping changes being required. Bailey Meter Co., 1050 Ivanhoe Road Cleveland 10, Ohio.



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2. LARGE CLEARANCES, between core, moving coil, and magnet pole pieces assures freedom of movement by eliminating sticking due to moving element rubbing on adjacent parts.
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4. CONTROL SPRINGS are fabricated from the highest quality phosphor bronze.
5. CERAMIC POINTER STOPS are used to prevent damage to the pointer due to accidental application of sudden overloads.
6. BALANCE WEIGHTS of helical type phosphor bronze are used to balance the moving element, so formed as to eliminate slipping or shifting.
7. MAGNETIC SHUNT is standard equipment on each DC instrument, insuring uniform damping characteristics.

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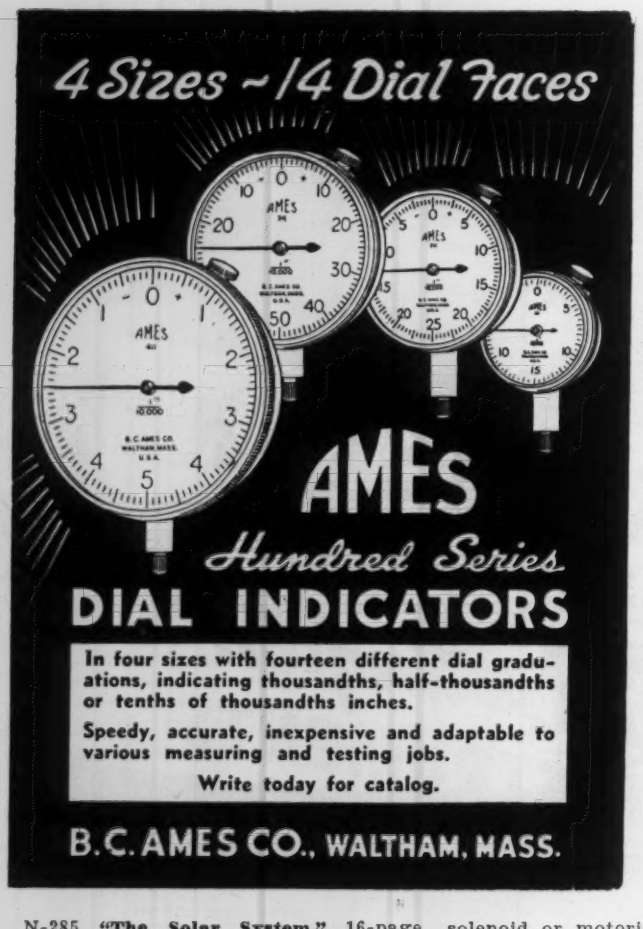
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N-285 **"The Solar System."** 16-page 5¾" × 8¾" May-June issue of this house organ (designated as Vol. 4, No. 1) designed for electronic engineers, servicemen and others, contains an article, "Solar and the Proximity Fuze," describing the part played by Solar capacitors in this development. Included are 1946 color codes for molded mica capacitors and a description of a capacitor-type a-c. follow-up motor. Solar Manufacturing Co., 285 Madison Ave., New York 17, N. Y.

N-286 **Switchboard and Portable Electrical Instruments.** 18-page 3¾" × 8½" Catalog No. 17 illustrates and describes ammeters, voltmeters and wattmeters of the moving-coil, electromagnetic and electro-dynamometer types. All moving systems are balanced in sapphire jewel bearings. Norton Electrical Instrument Co., Manchester, Conn.

N-287 **X-ray as a Foundry Tool.** 4-page 8" × 11" Reprint No. 1023 of an article from *Aluminum and Magnesium* covers the following topics: (1) how x-rays are produced, (2) equipment costs, (3) small casting production, (4) fluoroscopy, (5) personnel, and (6) operational costs. Radiographs, drawings and charts show defects encountered in magnesium castings. North American Philips Co., Inc., 100 E. 42nd St., New York 17, N. Y.

N-288 **Small High-pressure Solenoid Valve.** 4-page 8½" × 11" Bulletin 462 describes and illustrates the "Allied V5-100 Three-way, Two-position Solenoid Valve" which is said, despite its small size, to operate at pressures up to 150 lbs./in.². Allied Control Valve Co., Inc., South Norwalk, Conn.

N-289 **Automatic Liquid Metering System.** 8-page 8½" × 11" Bulletin F-44 illustrates and describes the "Fluidometer" for automatic measuring of light or heavy liquids. It consists of three principal parts: a control unit, meter, and solenoid or motorized valve unit which may be compactly grouped or remotely placed. Hetherington and Berner, Inc., 701 Kentucky Ave., Indianapolis 7, Ind.

N-290 **Non-destructive Testing Method.** 4-page 8½" × 11" Bulletin 4000 illustrates and describes the "Sperry Electric Detector" for fast, low-cost, non-destructive testing of tubing, bar stock and lead sheath, by an electrical resistance method. Sperry Products, Inc., Hoboken, N. J.

N-291 **Geiger Counter Used in Powder Metallurgy.** 8½" × 11" Reprint No. R-1022 of an article appearing in *Iron Age* illustrates and describes use of Geiger-counter spectrometer for quick and accurate measurements of the intensities of x-ray reflection in the production of cemented-carbide products. X-ray intensities and diffraction angles are measured directly without intermediate photographic steps. North American Philips Co., Inc., 100 E. 42nd St., New York 17, N. Y.

N-292 **Optical Micrometer.** 4-page 8½" × 11" bulletin illustrates and describes "Aireon Optical Micrometer" for gaging of transparent plastics and glass in curved shapes and inaccessible spots, by microscopic focusing on a crayon mark on the far side of the part to be measured. Aireon Manufacturing Corp., 166 W. Olive Ave., Burbank, Calif.

N-293 **Photoelastic Stress Analysis.** 8-page 5¾" × 8½" Pamphlet 246-KP illustrates and describes photoelastic stress analysis, provides engineers and scientific investigators with a survey of the photographic aspects of this method. Subjects covered are: optical theory, apparatus, models, photographic materials and record analysis and three dimensional analysis. Eastman Kodak Company, Rochester 4, N. Y.

N-294 **Automatic Electronic Equipment Inspection.** 4-page 8½" × 11" bulletin illustrates and describes the "Rotobridge" for checking electronic equipment for circuit wiring errors, proper values of resistance, capacitance and inductance. It may also be employed as a continuity and leakage checker and for testing transformers. Tests are go-no-go type, may be made by unskilled help. Communication Measurements Laboratory, 120 Greenwich St., New York 6, N. Y.

N-295 **Oscilloscope Calibration.** Single sheet 8½" × 11" pictures and describes the "Voltascope," a small self-contained instrument employed to calibrate an oscilloscope under operating conditions. Instrument operates on a-c. power and is provided with switch and pilot light. Adjusted at the factory, it requires no further adjustment. Polarad Electronics Co., 135 Liberty St., New York 6, N. Y.

N-296 **Automatic Controllers.** 18-page 8½" × 11" Bulletin No. 12 illustrates and describes a group of thermostatic controls for dampers, stokers, fans and pumps. Damper control available in package units ready for installation. Sampsel Time Control, Inc., Spring Valley, Ill.

N-297 **Metallurgical Furnace.** 4-page 8½" × 11" Bulletin No. LT-4604 pictures and describes "Lab-Type" cylindrical controlled-atmosphere furnace convertible for salt or lead bath work. Furnace operates at temperatures up to 2000°F. with gas-tight retort temperatures to 1825°F. for carburizing, decarburizing, or for bright annealing in hydrogen atmospheres. Boder Scientific Co., 719 Liberty Ave., Pittsburgh 22, Pa.

N-298 **Vibration Exciter and Calibrator.** 4-page 8½" × 11" Bulletin No. 122 describes and illustrates "MB" vibration exciter and calibrator: a machine said to serve as a precision calibrator for vibration pick-up units, or as an exciter to shake out the trouble spots in machinery by finding resonances excited by vibration forces during operation. MB Manufacturing Co., Inc., New Haven 11, Conn.

N-299 **Stainless Steel Bellows.** 12-page 8½" × 11" Booklet No. SSB-46 describes and illustrates stainless steel bellows as equalizers, compensators, expansion joints, flexible connectors, for flow control, vapor and steam traps, thermostatic instruments, electrical controls, etc. Cross-section views, specification charts and other useful data for engineers and designers are included. Chicago Metal Hose Corp., Maywood, Ill.

N-300 **Test Plugs.** 2-page 8½" × 11" catalog section describes and illustrates production testing plugs for testing electronic equipment, analyzing circuit wiring and component parts by means of cables which are plugged into tube sockets. Communication Measurements Laboratory, 120 Greenwich St., New York 6, N. Y.

N-301 **Low-resistance Measurement.** 4-page 8½" × 11" Bulletin No. 1805 describes three instruments for measuring low resistances. "Bridge-Meg" combines an insulation resistance tester with a Wheatstone bridge. "Ducter" battery-operated tester measures ohmic resistances down to a few millionths of an ohm without manipulation. Midget "Megger" battery-operated circuit-testing direct-indication ohmmeter has range selection from 0 to 3 ohms up to 100 to 200,000 ohms. James G. Biddle Co., 1211-13 Arch St., Philadelphia, Pa.

N-302 **Precision Compass.** 8½" × 11" catalog sheet pictures and describes "Model 1576" illuminated compass for aviation and marine use, said to contain every known compensation and correction. Other features are, accuracy to within ±1°, finger tip compensation, movable lubber line, index line scale and course indicator. Sherrill Instrument Co., Sherrill Building, Peru, Ind.

N-303 **Duplicating Attachment for Machine Tools.** 8-page 8½" × 11" Bulletin CC-2 describes and illustrates a combined air- and hydraulically-controlled duplicating attachment which may be used on lathes or boring mills to produce workpieces with contours which exactly correspond to a thin metal template or master part. Attachment does not tie up machines, thereby permitting regular work at any time. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.

N-304 **Automatic Hydraulic Flow Regulator.** 4-page 8½" × 11" bulletin pictures and describes a constant-flow regulator for hydraulic systems. Diameter of regulator is a fraction of an inch more than that of line. Its use assures predetermined rate of flow regardless of pressure or back pressure. Flow in reverse direction is unlimited, permitting utilization where constant feed must be maintained. Waterman Engineering Co., 721 Custer Ave., Evanston, Ill.

N-305 **Boiler Feedwater Control.** 4-page 8½" × 11" Bulletin 103-C illustrates and describes "Fireye" electronic floatless boiler feedwater control, consisting of two units: a water level indicating probe-type fitting, operating on low voltage wired to a pump and alarm control. In the triple-probe type, top and middle probe determine high and low level; lowest probe defines danger point, shutting off fuel supply and sounding an alarm. Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.

N-306 **Small Multiple-contact Electric Connector.** 4-page 8½" × 10½" bulletin pictures and describes "XL" series connectors, plug and receptacle type. Features are: Midget size, 2 3/32" overall length by ⅝" max. diameter; light weight, 0.0792 and 0.0992 lb. respectively; locking device; polarizing means; cable relief spring; silver plated brass contacts. Cannon Electric Development Co., 3209 Humboldt St., Los Angeles 31, Cal.

N-307 **Synchronizing Generator.** 8½" × 11" catalog sheet pictures and describes model PT101 "Polarad" television synchronizing generator applicable for tele-

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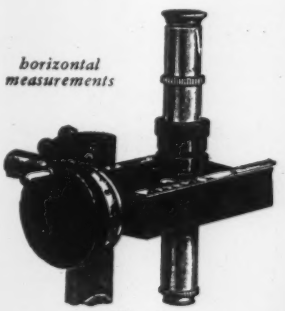

Fig. 1

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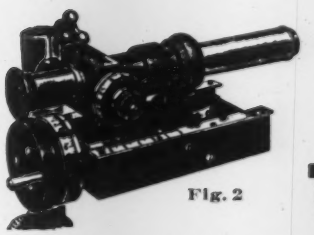

Fig. 2

Vertical orientation permits use as a small cathetometer for vertical linear measurements (Fig. 3). Interchangeability of microscope objectives and eyepieces permits a wide selection of magnifications.

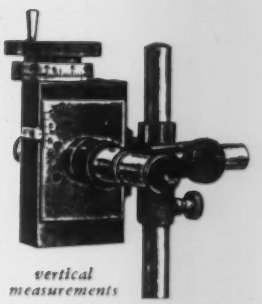

Fig. 3

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N-308 **Miniature Electrical Instruments.** 12-page 8½" × 11" Bulletin No. 105 describes and illustrates the "MB" line of miniature electrical instruments, said to have the accuracy requisite for industrial instrument use. Small size permits mounting in 1" to 1½" dia. panel opening. MB Manufacturing Co., Inc., Instrument Div., 331 East St., New Haven 11, Conn.

N-309 **"Aminco Laboratory News."** 8-page 8½" × 11" Vol. 3, No. 2 issue of this house organ contains articles of technical interest and the company's partial line of industrial laboratory and scientific instruments. Featured are a listing of the most important advances in science made during 1945 and "New Inventions and Discoveries" a listing of pertinent patents issued over a two-month period. American Instrument Co., 8030 - 8050 Georgia Ave., Silver Spring, Md.

N-310 **Regulated Power Supplies.** 2-page 8½" × 11" bulletin pictures and describes Models 1100 and 1110 regulated power supplies, differing only in panel arrangements, for laboratory or industrial use. Regulated high voltage and unregulated heater winding are isolated from each other and from chassis, making it possible to use these supplies as sources of "B" or "C" voltage. Communication Measurements Laboratory, 120 Greenwich St., New York 6, N. Y.

N-311 **Internal Comparator.** 8-page 8½" × 11" Bulletin No. 31 illustrates and describes shock-absorbing "Comtorplug" internal comparator for precision gaging. This gage permits accurate 2-point gaging, even in unskilled hands. It determines measurements to fractions of one ten-thousandth inch, reaching extreme bottom of blind holes or shoulders. Comptor Co., Waltham, Mass.

N-312 **Decade Units.** 8-page 8½" × 11" bulletin illustrates and describes dolly-mounted decade circuit components said to provide the engineer, professor and technician an almost limitless number of combinations: filter circuits, power supply loads, phase shift circuits, phase correction circuits, inductive or capacitive loads for testing relay contacts, resonance circuits, control circuits, and voltage divider circuits. Harvey-Wells Electronics, Inc., Southbridge, Mass.

N-313 **Electric Furnace.** 2-page 8½" × 11" Bulletin G2 pictures and describes "Temco Model GRP" electric furnace for the laboratory, research engineer, tool shop or plant. Top working temperature of 1500°F. may be reached in 30 minutes, and peak loads up to 1850°F. may be maintained for short periods. Pyrometer shows temperature in both °F. and °C. Thermo Electric Mfg. Co., 480 W. Locust St., Dubuque, Iowa.

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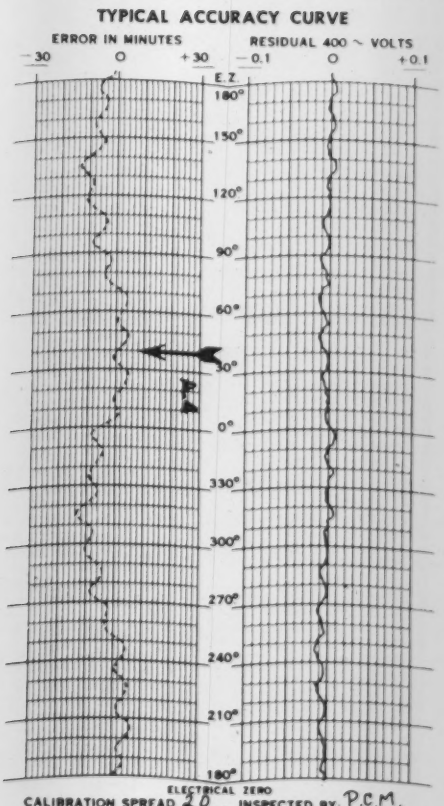

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THE 1947 INSTRUMENTS INDEX

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Published Monthly on the 15th by
THE INSTRUMENTS PUBLISHING COMPANY
1117 Wolfendale Street, Pittsburgh 12, Pa.
RICHARD RIMBACH, *MANAGING EDITOR*

M. F. Béhar, *Editor*
Malcolm Lovejoy, *Assistant Editor*

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Subscription: U. S. and possessions: one year $2.00, two years $3.00. All other countries, including Canada, one year $7.00, three years $14.00, payable in advance (remit by New York draft).

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The 1947 Instruments Index

THIS issue of the INDEX has been compiled to meet the need of users of instruments and devices for measurement, inspection, testing and control, for a purchasing directory of such equipment. No INDEX has appeared for 2½ years due to paper limitations. Since the 1944 INDEX, 121 companies' names and products, which have not appeared previously, were included. The INDEX contains the answers to 99% of the inquiries which *Instruments* receives from subscribers, and places at your instant command a wealth of information.

This directory is arranged, indexed and cross-indexed to make its contents easily available.

The Index Section—"Who makes what"—is the most important. Anyone who wants to know where he can buy or secure information on a certain product will find the product properly indexed and cross-indexed, and under it the names of the manufacturers of this equipment and manufacturers' sole representatives.

Indexing System. Products are indexed under the main word. In cases where a name is ambiguous, or where the item is known under two or more names, companies making such devices are listed under one heading and cross-references inserted under the other headings.

Specific Terms. You never are in need of "a gage" but of some particular kind of gage. Therefore we do not list manufacturers under broad general designations. For example, we do not list any names under the main heading "Meters" but we give the sources of supply for numerous classes and types of meters. Moreover, we do not list any names under "Meters, Liquid" alone, but we give under proper subheads the sources of supply for the *class* and *type* of liquid meter you may need.

Correctness of Headings. As explained above, main headings and subheads are technically correct. A few are not scientifically correct: they are names in common usage, recognized for the convenience of the majority.

Correctness of Listings. A few of the companies listed and advertising in the INDEX you already know. All of them are actively engaged in the manufacture of instruments and devices for measurement, inspection, testing and control. We have endeavored to list no firm names under specific headings unless the instruments made by such firms belong there by virtue of their design and construction. As a rule, we have to take the company's word that it could supply the product in question.

Completeness. More than 1200 manufacturers were canvassed in the last four months. In the last few weeks we sent representatives to call on manufacturers. Therefore, the omission of any manufacturer's name under any heading is due to the negligence of someone in his own organization.

Every effort has been made to restrict the names in the Index Section to (1) the actual manufacturers and (2) the sole authorized sales agencies. On the other hand, whenever you desire to order at one time a variety of equipment, made by different firms, you may find it most convenient to get in touch with a recognized, competent, "laboratory supply house." These houses are listed under "*Apparatus, Laboratory*," on page 16.

Instruments' Further Service. This Index contains the answers to *only* 99% of your inquiries. If you cannot find the product or the name you want, communicate with the Information Section, Instruments Publishing Co., 1117 Wolfendale St., Pittsburgh 12, and every effort will be made to furnish the information promptly.

Suggestions. We shall appreciate suggestions regarding:

1. Headings not at present found in this Index which should be there,
2. Firms listed erroneously, and
3. Other inaccuracies which may have crept in despite all precautions.

Use this INDEX consistently. You will find the companies listed herein equipped to render the kind of service which saves time and helps make satisfied customers.

Where companies in whose products you are interested have omitted descriptions, your cooperation is invited in bringing this to the attention of the supplier or the publisher. Also, whenever the INDEX has aided you, please inform the manufacturer that his data in THE INSTRUMENTS INDEX were of help to you.

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(See Testers, Abrasion)

ABSOLUTE PRESSURE INDICATORS (See Gages, Absolute Pressure)

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Taylor & Co., W. A.
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ACOUSTIMETERS (See Sound Level Meters)

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ALARMS, Carbon Monoxide, Combustible Gas, etc.
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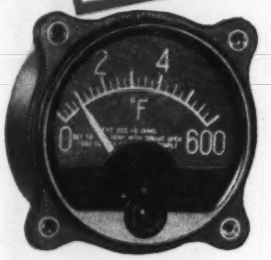

TEMPERATURE INDICATORS

Engine Temperature Indicators both 2" and 3½" standard AN cases. Indicators available for 2 ohm copper-constantan systems and 2, 3 and 8 ohm iron-constantan systems. Both single and dual indicators are available. Indicators for chromel-alumel thermocouples can also be supplied.

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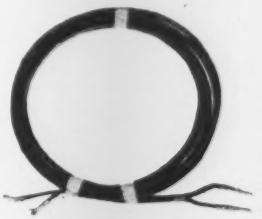
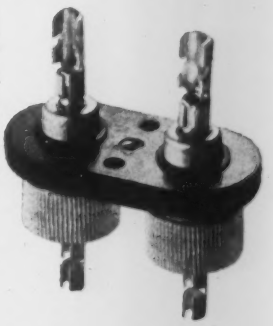


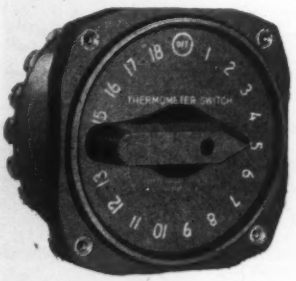
LEAD WIRES

Calibrated iron-constantan, copper-constantan and chromel-alumel lead wires are stocked in the most commonly used sizes. Prompt delivery on special lengths. Continuous type lead wire for use with either millivoltmeter indicators or potentiometers from stock.

FIRE-WALL CONNECTORS

Fire-wall connectors for use between engine and wing leads are available. Both commercial and AN types for all types of temperature indicating systems.





ROTARY SELECTOR SWITCHES

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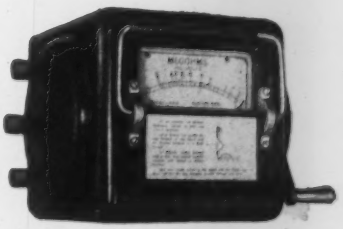

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Tagliabue Div.
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Rubicon Co
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AMMETERS, Thermionic
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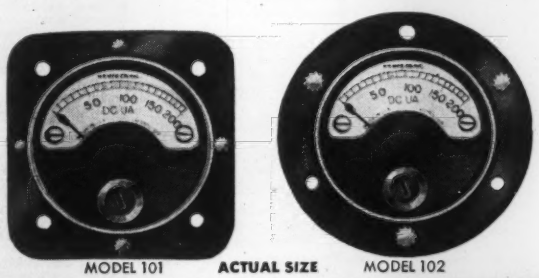

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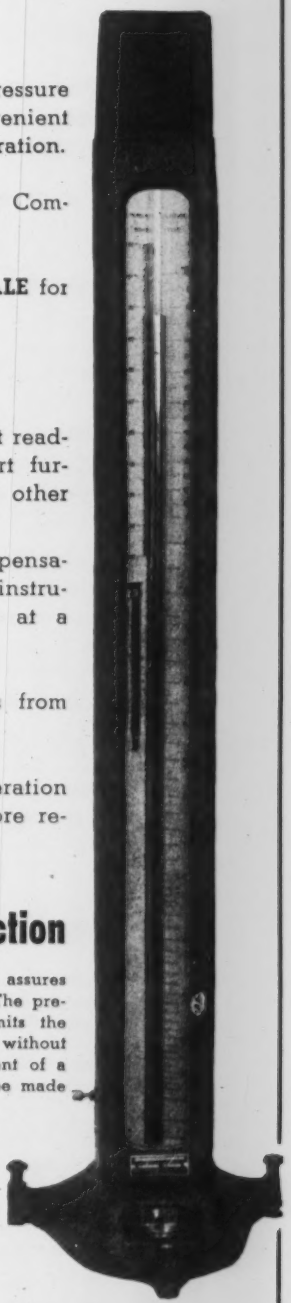

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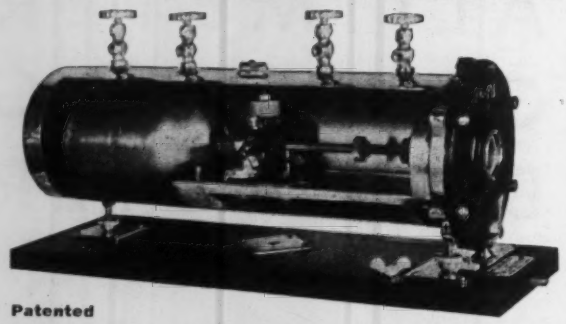

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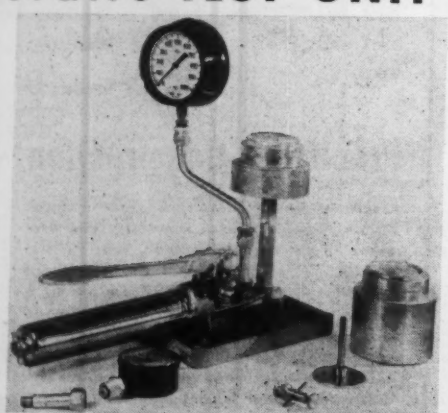

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Heusser Instrument
Jacobs Bros. Co.
Seederer-Kohlbusch, Inc
Thompson Balance
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Williams Apparatus Co.

BALANCES, Specific Gravity
Baird Associates
Becker Inc., Christian
Central Scientific
Chicago Apparatus Co.
Eberbach & Son
Exact Weight Scale Co.
Heusser Instrument
Humboldt Mfg. Co.
Newark Scale Works
Pfaltz & Bauer, Inc.
Refinery Supply
Rushfel Co.
Seederer-Kohlbusch, Inc.
Thomas Co., Arthur H.
Torsion Balance Co.
Troemner Henry
Welch Scientific

BALANCES, Surface Tension
Becker Inc., Christian
Central Scientific Co.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.

BALANCES, Triple Beam
Ainsworth & Sons, Inc.
Central Scientific
Distert Co., Harry W.
Exact Weight Scale Co.
Fisher Scientific Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry
Welch Scientific

BALANCES, Volumetric Flask
Becker Inc., Christian
Seederer-Kohlbusch, Inc.
Torsion Balance Co.

BALANCES, Westphal
Becker Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Eimer & Amend
Fisher Scientific
Pfaltz & Bauer, Inc.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry

BALANCING MACHINES, Dynamic
Annis Co.
Bear Mfg. Co.
Cole Instrument
Electrocon Corp.
Exact Weight Scale
Ferner Co.
General Elec. Co.
Gisholt Machine Co.
Globe Tool & Engg.
Olsen Testing Machine
Sperry Gyroscope Co.
Suter, Alfred
Waugh Labs. (portable)
Westinghouse Elec.

BALANCING MACHINES, Static
Anderson Bros. Mfg. Co.
Annis Co.
Bear Mfg. Co.
Cole Instrument
Commerce Pattern Fdy.
Exact Weight Scale
Ferner Co.
Gisholt Machine Co.
Globe Tool & Engg.
Ideal Commutator Dresser
Olsen Testing Machine
Suter, Alfred
Taylor Mfg. Corp.
Toledo Scale Co.

BALLISTIC INSTRUMENTS, Crime Detection (See Microscopes, Ballistic Comparison)

BALLISTIC INSTRUMENTS, Electrical
Berkeley Scientific
Cambridge Inst. Co.
Cole Instrument
General Elec. Co.
Leeds & Northrup Co.
Precision Ther. & Inst.
Rawson Electrical Inst.
Rubicon Co
Sensitive Research Inst.
Taco Engineering
Triplett Elec. Inst.
Westinghouse Elec. & Mfg.

BALLISTIC INSTRUMENTS, Ordnance
Bausch & Lomb Opt.
Berkeley Scientific
Cambridge Inst. Co.
Precision Ther. & Inst.
Rawson Elec. Inst. Co.

BANK & TURN INDICATORS
Burton Mfg. Co.
Eclipse-Pioneer Div.
Schwien Engineering

BARKOMETERS
Central Scientific Co.
Eimer & Amend
Fleischhauer & Son
G M Mfg. Co., Inc.
Griebel Co.
H-B Inst. Co., Inc.
Moeller Instrument Co.
Precision Therm. & Inst.
Rushfel Co.
Schulthels Corp.
Tagliabue Div.
Taylor Inst. Cos.

BAROGRAPHS (See Barometers, Recording)

BAROMETERS, Altitude
American Askania Corp.
Am. Paulin System
Chelsea Clock Co.
Eclipse-Pioneer Div.
Friez & Sons
Fuess, Inc.
Green, Henry J.
H & H Thermostats
Ideal Lab. Tool
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Inst. Div.
Mine Safety App. Co.
Panoramic Radio Co.
Precision Thermometer
Taylor Inst. Cos.
Technicraft Engg.
Wallace & Tiernan
Warren Knight
Welch Scientific
Westinghouse Elec.
White Co.

BAROMETERS, Aneroid
Am. Paulin System
Central Scientific Co.
Chelsea Clock Co.
Eclipse-Pioneer Div.
Fee & Stemwedel
Fisher Scientific
Friez & Sons
Fuess, Inc.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Inst. Co.
Mine Safety App. Co.
Precision Instrument
Roth Bros. Chronometer
Scientific Inst. Co.
Stewart, M. C.
Taylor Inst. Cos.
Tenrite Instrument Co.
Wallace & Tiernan
Warren Knight Co.
White Co.

BAROMETERS, Mercurial
Alpha Instrument Co.
Builders-Providence
Central Scientific Co.
Chicago Apparatus Co.
Cole Instrument
Defender Automatic Reg.
Dietert Co.
Eberbach & Son
Eimer & Amend
Electronic Products Co.
Fisher Scientific Co.
Friez & Sons
Fuess, Inc
Gaertner Scientific
Green, Henry J.
Ideal Lab. Tool
Kessler Co.
(Cont'd)

BAROMETERS, Mercurial (Cont'd)
Manning, Maxwell&Moore
Moeller Instrument Co.
Pioneer Instrument Co.
Precision Thermometer
Sargent & Co.
Scientific Inst. Co.
Specialty Glass Co.
Stoelting Co.
Tagliabue Div.
Taylor Inst. Cos.
Trimount Inst. Co.
Uehling Instrument Co.
Wallace & Tiernan
Weksler Thermometer
Welch Scientific

BAROMETERS, Recording
Aerological Developments
Am. Paulin System
Bristol Co.
Brown Inst. Co.
Foxboro Co.
Friez & Sons
Fuess, Inc.
Green, Henry J.
Hathaway Instrument
H & H Thermostats
Impact Register
Kenyon Instrument Co.
Keuffel & Esser Co.
Taylor Inst. Cos.
Uehling Instrument Co.

BAROMETRIC PRESSURE INDICATORS
Am. Paulin System
Bristol Co.
Electronic Products
Fee & Stemwedel
Foxboro Co.
Friez & Sons
Fuess, Inc.
(Cont'd)

BAROMETRIC PRESSURE INDICATORS (Cont'd)
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Div.
Manning, Maxwell&Moore
Meriam Inst. Co.
Pioneer Instrument Co.
Precision Therm.
Statham Labs.
Taco Engineering
Tagliabue Div.
Taylor Inst Cos.
Uehling Instrument Co.
Wallace & Tiernan
Warren-Knight Co.

BAROMETRIC PRESSURE RECORDERS (See Barometers, Recording)

BATTERIES, Dry
Burgess Battery Co.
Kellogg Switchboard
Magnavox Co.
Mallory and Co.
RCA Manufacturing Co.
Walker-Jimieson, Inc.

BATTERY CHARGERS
Automatic Electric Sales
Benwood Linze
Control Corp.
Cutler-Hammer, Inc.
Eclipse-Pioneer Div.
Electrical Facilities, Inc.
Federal Telegraph Co.
Ferranti Electric, Inc.
General Electric Co.
Hy Ef Electrical Products
Kellogg Switchboard
Mallory & Co.
Mellaphone Corp.
(Cont'd)

BAILEY BOILER METER

● This dependable and accurate guide to maximum combustion economy is easily understood and followed by operators. It indicates, records and integrates Steam Flow from the boiler, records Air Flow supplied for combustion, and records Flue Gas Temperature.

Best combustion efficiency is secured by keeping Steam Flow and Air Flow pens together so that the records coincide one upon the other. The record of flue gas temperature when compared with that of Steam Flow shows the condition of baffles and tubes, and indicates heat absorption efficiency.

The Bailey Steam Flow-Air Flow Boiler Meter reduces fuel costs, lessens maintenance and outage, lowers standby costs and adds capacity. It is suitable for boiler plants operating units of 100 h.p. or more fired with stokers, pulverized coal, gas, oil or other fuels.

In order to obtain the maximum benefit from the Bailey Boiler Meter, it should be made an integral part of a Bailey Combustion Control System so that combustion losses are automatically corrected for even as they tend to appear.

For further details, refer to Sweet's Engineering Catalog or send for a copy of bulletin No. 46.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

BATTERY CHARGERS (Cont'd)
Schauer Mach. Co.
Ward Leonard Electric Co.
Westinghouse Elec.

BATTERY ELIMINATORS
Altomatic Electric Sales
Benwood Linze
Consolidated Engg.
Electro Products Labs.
Electronic Prod. Co.
Electro Products Lab.
Federal Telegraph Co.
General Radio Co.
Kellogg Switchboard
National Time & Signal
RCA Manufacturing
Schauer Mach. Co.
Standard Electric Time Co.

BATTERY TESTERS (See Testers & Testing Machines, Battery)

BEAM COMPASSES (See Drawing Instruments)

BEARING CIRCLES
Alpha Instrument Co.
Geophysical Inst. Co.
Kollmorgen Optical Co.

BEARING TESTERS (See Testers Bearing)

BEARINGS, BALL, Miniature
Ferner Co.
Landis & Gyr, Inc.
Miniature Prec. Bearings

BEATING TESTERS (See Testers, Beating)

BELLOWS, METALLIC
Askania Regulator Co.
Bridgeport Thermostat Co.
Chicago Metal Hose
Clifford Mfg. Co.
Cook Electric Co.
Fulton Syphon Co.
Ranco, Inc.

BENCHES, Optical
Baird Associates
Bausch & Lomb
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Freber-Faybor Co.
Fuess, Inc.
Gaertner Scientific Corp.
Geophysical Inst. Co.
Jarrell-Ash Co.
E. Leitz, Inc.
Mico Instrument Co.
Carl Zeiss, Inc.

BEVEL PROTRACTORS (See Drawing Instruments)

BIN LEVEL INDICATOR (See Controllers, Automatic, Granular Material Level)

BINNACLES (See Nautical Instruments)

BINOCULARS
Alpha Instrument Co.
Am. Telescope Labs.
Bausch & Lomb Optical
Clark & Son
Eclipse-Pioneer Div.
Fee & Stemwedel
Kern Co.
Kollsman Inst. Div.
Leitz, Inc.
Testrite Instrument Co.
Unertl Optical Co.
Warren-Knight Co.
White Co.
Wollensak Optical Co.

BINOCULARS, Polarizing, Variable Density, etc.
Amer. Telescope Labs.
Polarizing Inst. Co.

BIOLOGICAL SPECIMENS
Central Scientific Co.
Chicago Apparatus Co.
General Biological Sup.
Welch Scientific

BLAST METER (See Flow Meters, Blast)

BOILER METERS
American Meter Co.
Bailey Meter Co.
Brooke Engineering
Brown Inst. Co.
Esi Inst. Co.
Fischer & Porter
Foxboro Co.
Hays Corp.
Hoexsey Co.
Leeds & Northrup
Republic Flow Meters
Simplex Valve & Meter
Tagliabue Div.

BOLOMETERS
Baird Associates
Ballantine Labs.
Cambridge Inst. Co.
Eppley Laboratory
Hoffman Co. S. O.
Taco Engineering

BOMBS, High pressure for testing bottom hole samples, Oil & Gas
Precision Scientific
Ruska Inst. Corp.

BOMBS, Hydrogenation
American Inst. Co.
Parr Instrument Co.
Precision Scientific
Ruska Inst. Corp.

BOMBS, Lean Oil
Daniel Orifice Fitting Co.
Parr Instrument
Precision Scientific

BOMBS, Micro Combustion
Parr Instrument Co.
Precision Scientific

BOMBS, Oxygen
Parr Instrument Co.
Precision Scientific

BOMBS, Reid Vapor Pressure
American Inst. Co.
Central Scientific Co.
Daniel Orifice Fitting
Precision Scientific Co.
Refinery Supply Co.
Tagliabue Div.

BOMBS, Sodium Peroxide
Parr Instrument Co.

BOMBS, Specific Gravity
Central Scientific Co.
Daniel Orifice Fitting
Refinery Supply Co.

BOMBS, Sulphur
Central Scientific Co.
Parr Instrument Co.
Refinery Supply

BOMBS, Temperature
Martin Decker Corp.

BORE INSPECTION INSTRUMENTS (See Telescopes, Bore, Inspection)

BOTTLES, Cubic Foot
American Meter Co.
Central Scientific Co.
Fish-Schurman Co.
Lambert Meter Co., Inc.
Precision Scientific Co.
Superior Meter Co.

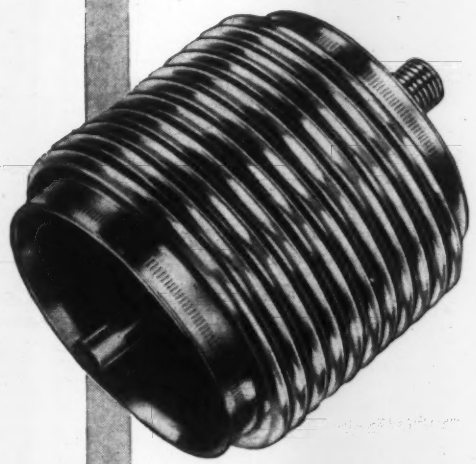
BOTTLES, Specific Gravity
Ace Glass Inc.
American Meter Co.
Central Scientific Co.
Chicago Apparatus Co.
Corning Glass Works
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Kimble Glass Co.
Scientific Glass App.
Specialty Glass Co.
Welch Scientific

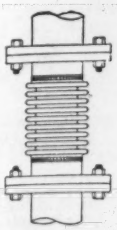
BOTTLES, Weighing
Ace Glass Inc.
Central Scientific Co.
Chicago Apparatus Co.
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
Kimble Glass Co.
Scientific Glass App.
Specialty Glass Co.
Welch Scientific

BOXES, Arctic Shunt
Cole Instrument
Leeds & Northrup
Rubicon Co.
Shalleross Mfg. Co.

BOXES, Ratio
Cambridge Inst. Co.
Cole Instrument
Daven Co
General Radio Co.
Leeds & Northrup
Rubicon Co.
Sensitive Research Inst.
Shalleross Mfg. Co.

BOXES, Resistance
American Automatic Elec.
Cambridge Inst. Co.
Central Scientific
Chicago Apparatus Co.
Clough-Brengle Co.
Cole Instrument
Cutler-Hammer, Inc.
Daven Co
General Radio Co.
Leeds & Northrup
(Cont'd)





Expansion Joint

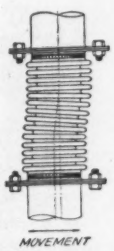
C. M. H. STAINLESS STEEL BELLOWS

Assure

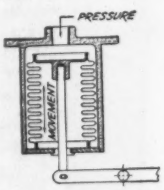
long life
low maintenance

The outstanding features of corrosion-resistant 18-8 Austenitic *Stainless Steel* enable wider application of C. M. H. Bellows. This is because *stainless steel* has the necessary characteristics to assure long life and low maintenance cost.

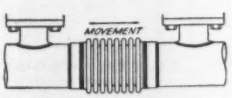
C. M. H. Bellows, for example, with a working range of sub-zero to a scaling point of 1800°F. are not bothered by temperatures . . . hot or cold. In addition, they have multiple-ply construction for greater strength; ferrous fittings, attached by Circular Seam Welding to insure leak-proof joints; uni-metal assemblies which avoid troubles often encountered when bi-metal or solder joints are used. These and other features warrant your consideration. Write for Bulletin SS B-46.



Flexible Connector



Pressure Motor



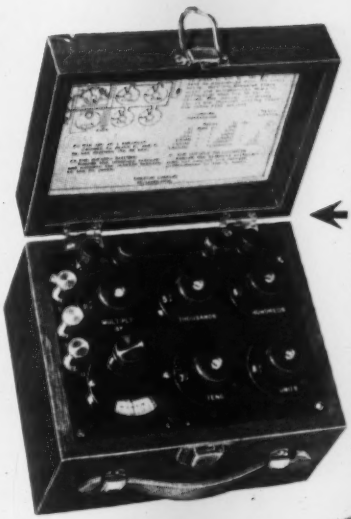
Compensator for Headers

Flexible Metal Hose for Every Industrial Use

CHICAGO METAL HOSE CORPORATION
MAYWOOD, ILLINOIS

Plants: Maywood and Elgin, Ill.

RUBICON ELECTRICAL MEASURING INSTRUMENTS



PORTABLE WHEATSTONE BRIDGE

An accurate and fully portable instrument for use in laboratory, shop and field. Includes four-dial rheostat, single ratio dial affording 7 decimal ratios, 4.5 volt dry battery and sensitive pointer-type galvanometer. Designed to give complete dependability over many years of service. Also available with Murray and Varley Loop Circuits. Guaranteed limit of error 0.1%.

SPOTLIGHT GALVANOMETER

This instrument is of the taut suspension type, is self-contained, exceptionally sturdy and possesses ample sensitivity for the great majority of all galvanometer applications. Indication employs an internal multiple-reflection optical system, achieving sensitivities seldom attained in enclosed lamp-and-scale galvanometers. Scale can be read with ease to within .2 mm. division. These instruments are inherently stable under ordinary conditions of usage and require no leveling.

PORTABLE PRECISION POTENTIOMETER

Available in a variety of models and ranges to suit most applications, including thermocouple measurements, meter calibration, and pH determination (with separate electrode systems). For measuring voltages within their respective ranges, these instruments require no external accessories of any kind, since they include galvanometer, standard cell and auxiliary battery. Designed to give long years of service under hard use. Guaranteed limit of error is 0.1%.

Rubicon Co.

ELECTRICAL INSTRUMENT MAKERS SINCE 1921

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Instruments
in working togs . . .
FOR LAB, SHOP OR FIELD USE

Type RN Wheatstone Bridge, typical of "Industrial Instruments" for lab. use. Also . . .

Resistance and Capacitance Decades; Direct-reading Comparison Bridge; Voltage Breakdown Testers; Kelvin Bridge; Megohm Bridge; Megohm Meter; Conductivity Apparatus; etc.

★ **Equally at home in the lab, shop or out in the field, "Industrial Instruments" can save you untold time, trouble and expense in the more critical control of raw materials, processes, products, applications. Exceptionally rugged. Simplest operation. Priced well within the most modest budgets.**

Model RD-4 Solu-Bridge. Typical of "Industrial Instruments" for shop or production control use. Also . . .

Widest selection of conductivity measurement equipment and cells; Solu-Bridge Controller for automatic solution control; Recorders; Capacitance and Resistance Limit Bridges; etc.

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Conductivity Bridges for testing water and industrial solutions; portable electrical test equipment; etc.

★ **Write for Literature . . .**

Electrical test; conductivity measurement; chemical test—corresponding literature available on request. Please state your particular field of interest. Submit instrumentation problems or requirements.

Industrial Instruments

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BOXES, Resistance (Cont'd)
Meter Devices Co.
Muter Company
Ohmite Mfg. Co.
Radio City Products
Reiner Electronics
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Thwing-Albert Inst. Co.
Triumph Mfg. Co.
Welch Mfg. Co.

BOXES, Thermostat
Andrew, Victor J.
Thwing-Albert Inst. Co.

BRAKE TESTING METER (See Testers and Testing Machines, Brake)

BRIDGES, ELECTRICAL, A-c.
American Radio Co.
Andrew, Victor J.
Assembly Products
Associated Research
Cambridge Inst. Co.
Clough-Brengle Co.
Cole Instrument
Consolidated Engg.
Daven Co.
Electronic Design Corp.
Electronics, Inc.
Electronic Prod. Co.
Freed Transformer
General Elec. Co.
General Radio Co.
Leeds & Northrup Co.
Radio City Products
Reiner Electronics
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic
Supreme Inst. Corp.
Taco Engineering
Tobe Deutschmann Corp.
United Transformer
Waugh Laboratories

BRIDGES, ELECTRICAL, Capacitance
Aerovox Corp.
Assembly Products
Associated Research
Cambridge Inst. Co.
Central Scientific Co.
Clippard Inst. Lab.
Clough-Brengle Co.
Cole Instrument
Communication Meas. Lab.
Electronic Design Corp.
General Elec. Co.
General Radio Co.
Industrial Inst. Inc.
Jackson Electrical Inst.
Leeds & Northrup Co.
Rubicon Co.
Sherron Metallic
Solar Mfg. Corp.
Tobe Deutschmann Corp.
Triplett Elec. Inst. Co.
Triumph Mfg. Co.

BRIDGES ELECTRICAL, Conductivity
Associated Research
Cambridge Inst. Co.
Central Scientific Co.
Cole Instrument
Electronic Prod. Co.
Industrial Inst. Inc.
Leeds & Northrup Co.
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic
Thwing-Albert Inst. Co.

BRIDGES, ELECTRICAL, D-c.
Associated Research
Clippard Inst. Lab.
Cole Instrument
Consolidated Engg.
Daven Co.
Electronics, Inc.
Eppley Laboratory, Inc.
General Radio
Leeds & Northrup
Photobell Corp.
Radio City Products
Reiner Electronics
Rubicon Co.
Shallcross Mfg.
Sherron Metallic
Thwing-Albert Inst. Co.
Winslow Co.

BRIDGES, ELECTRICAL, Hoopes
Leeds & Northrup Co.

BRIDGES, ELECTRICAL, Impedance
American Radio Co.
Clarke Inst. Corp.
Cole Instrument
Daven Co.
Freed Transformer
General Radio
Hewlett-Packard
Leeds & Northrup
Photobell Corp.
Thwing-Albert Inst. Co.

BRIDGES, ELECTRICAL Inductance
Andrew, Victor J.
Associated Research
Cambridge Inst. Co.
Cole Instrument
Daven Co.
Freed Transformer
General Radio Co.
(Cont'd)

BRIDGES, ELECTRICAL, Inductance (Cont'd)
Industrial Instr. Inc.
Leeds & Northrup Co.
Raytheon Mfg. Co.
Rubicon Co.
Triumph Mfg. Co.
United Transformer Corp.

BRIDGES, ELECTRICAL, Kelvin
Associated Research
Beck Bros.
Cambridge Inst. Co.
Central Scientific
Cole Instrument
Electro Products Lab.
Eppley Laboratory
General Elec. Co.
Leeds & Northrup Co.
Rubicon Co.
Shallcross Mfg. Co.
Tagliabue Div.
Thwing-Albert Inst. Co.

BRIDGES, ELECTRICAL, Limit
Assembly Products
Cole Instrument
Communication Meas. Lab.
Freed Transformer
Leeds & Northrup
Radio City Products
Reiner Electronics
Rubicon Co.
Shallcross Mfg. Co.
Taco Engineering
Winslow Co.

BRIDGES, ELECTRICAL, Megohm
Associated Research, Inc.
Beck Bros.
Cambridge Inst. Co.
Clough Brengle Co.
Cole Instrument
Electro Products Lab.
Freed Transformer
General Elec. Co.
General Radio Co.
Industrial Instruments
Leeds & Northrup Co.
RCA Manufacturing
Roller-Smith Co.
Shallcross Mfg. Co.
Sticht Co., Herman
Taco Engineering
Triumph Mfg. Co.

BRIDGES, ELECTRICAL, Power-Factor
Cambridge Inst. Co.
Clough-Brengle Co.
General Electric Co.
General Radio Co.
Industrial Instruments
Leeds & Northrup Co.

BRIDGES, ELECTRICAL, Slide Wire
Beck Bros.
Cambridge Inst. Co.
Central Scientific Co.
Cole Instrument
Leeds & Northrup Co.
Meter Devices Co.
Roller-Smith Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht Co., Inc.
Tagliabue Div.
Thwing-Albert Inst. Co.
Welch Mfg. Co.

BRIDGES, ELECTRICAL, Vacuum Tube
Andrew, Victor J.
Central Scientific Co.
Cole Instrument
Electronic Engineers
Electronic Prod. Co.
Electro Products Lab.
Fisher Scientific Co.
General Elec. Co.
General Radio Co.
Harvey Radio Labs.
RCA Manufacturing
Shallcross Mfg. Co.
Taco Engineering
Televiso Co.
Thwing-Albert Inst. Co.
Triumph Mfg. Co.
Wilson & Co.

BRIDGES, ELECTRICAL, Wheatstone
Assembly Products
Associated Research
Beck Bros.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Cole Instrument
Communication Meas. Lab.
Daven Co.
Electronics, Inc.
Electro Products Lab.
Electro-Tech Equip.
Eppley Laboratory
General Elec. Co.
General Radio Co.
Industrial Inst. Inc.
Leeds & Northrup Co.
Muter Company
Roller-Smith Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht Co., Inc.
Tagliabue Div.
Thwing-Albert Inst. Co.
Waugh Laboratories
Welch Mfg. Co.
Winslow Co.

B.T.U. INDICATORS
Central Scientific Co.
Cutler-Hammer, Inc.
Precision Scientific

BURETTES
Ace Glass Inc.
Burrell Tech. Supply
Central Scientific Co.
Eimer & Amend
Electronics Products
Fish-Schurman Co.
Fisher Scientific Co.
Griebel Co.
Hays Corp.
Kimble Glass Co.
Macalaster Bicknell Co.
Machlett & Son
Microchemical Service
Rascher & Betzold
Sargent & Co.
Scientific Glass App. Co.
Scientific Instr. Co.
Specialty Glass Co.
Welch Scientific

CABIN PRESSURE CONTROLS (Aeroplane)
Eclipse-Pioneer Div.
Kollsman Inst. Div.
Schwien Engineering

CABINETS
Columbia Metal Box
Faistrom Co.
Grammes & Sons, L. F.
Kirk & Blum Mfg. Co.
Lewyt Metal Prod.
Rueckert Mfg. Co.
Stafford Co.
Warwick Products Co.

CABLE TESTERS (See Testers, Cable)

CALIBRATING EQUIPMENT for Electrical Instruments & Meters
Amer. Time Products
Assembly Products
Associated Research, Inc.
Beck Bros.
Cambridge Inst. Co.
Clippard Inst. Lab.
Cole Instrument
Commercial Research
Daven Co.
Eastern Specialty Co.
Electric Tachometer Corp.
Electrical Facilities, Inc.
Ferranti Electric, Inc.
General Electric Co.
Gray Instrument Co.
Hathaway Instrument Co.
Heiland Research
Hewlett-Packard
Leeds & Northrup Co.
Marion Electrical Inst.
Measurements Corp.
Premier Crystal Labs.
Rawson Elec. Inst. Co.
RCA Manufacturing
Roller-Smith Co.
Rowe Radio Research
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Standard Electric Time
Taco Engineering
Televiso Co.
Thwing-Albert Instrument
Waugh Lab.
Western Electro-Mech.
Weston Electrical Inst.

CALIBRATING EQUIPMENT for Testing Machines
Amer. Time Products
Baldwin Southwark
Commercial Research
Dillon & Co., Inc., W. C.
Hathaway Instrument Co.
Pittsburgh Instrument
Saxl Instrument Co.
Taco Engineering
Thwing-Albert Instrument

CALIPER RULES
Brown & Sharpe
DoAll Co.
Lufkin Rule Co.
Millers Falls Co.
Starrett Co., L. S.
Union Tool Co.
Weber Co.
Welch Scientific
Zeiss, Inc., Carl

CALIPERS, Indicating
American Meas. Insts.
DoAll Co.
Federal Products Corp.
Indicating Calipers Co.
Starrett Co.

CALIPERS, Inside & Outside
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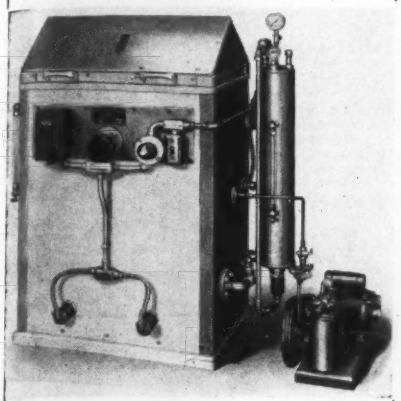
DoAll Co.
Eitzen Co.
Farrell-Birmingham (Large for Rolls)
Federal Products Corp.
Glogau & Co.
Indicating Calipers Co.
Jansson Gage Co.
Lufkin Rule Co.
Millers Falls Co.
Park Sales
Scherr Co., Inc.
Starrett Co.
Union Tool Co.
Welch Mfg. Co.
Zeiss, Inc., Carl

CALIPERS, Square
DoAll Co.
Starrett Co.

CALIPERS, Vernier
American Meas.
Brown & Sharp
Starrett, L. S.

SALT FOG
CORROSION TEST EQUIPMENT



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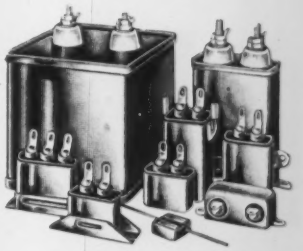
CLOSE TOLERANCE
ACCURATE RATINGS



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Central Scientific Co.
Emerson Apparatus Co
Fisher Scientific
Parr Instrument Co.
Welch Mfg. Co.
Precision Therm.
Wilkens-Anderson Co.

CALORIMETERS, Gas
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Central Scientific Co.
Connelly Iron Sponge
Cutler-Hammer, Inc.
Hays Corp.
Lambert Meter Co.
Precision Scientific Co.
Precision Thermometer
Wilkens-Anderson Co.

CALORIMETERS, Oxygen Bomb
Central Scientific
Emerson Apparatus
Fisher Scientific
Parr Instrument Co.

CALORIMETERS, Peroxide Bomb
Central Scientific
Fisher Scientific
Parr Instrument Co.

CALORIMETERS, Steam
Ellison Draft Gage Co.
Welch Scientific
Wilkens-Anderson Co.

CAMERAS, Microfilm
Abrams Instrument
Microstat Corp.

CAMERAS, SCIENTIFIC
Abrams Instrument
Adel Precision
Baird Associates
Bausch & Lomb Opt.
Buehler, Adolph I.
Cambridge Inst. Co.
Electro-Medical Lab.
Fecker, J. W.
Flett Laboratory
General Radio Co.
Heiland Research
Hoffman Co., S. O.
Jarrell-Ash Co.
Kern Co.
Leitz, Inc.
Micro Instrument Co.
Perkin-Elmer Corp.
Zeiss, Inc., Carl

CAMERAS, SCIENTIFIC, Back Reflection
Abrams Instrument
Hayes Scientific App.
Leitz, Inc.
North Amer. Philips

CAMERAS, SCIENTIFIC, Diffraction
American Inst. Co.
Baird Associates
North Amer. Philips
RCA Manufacturing Co.

CAMERAS, SCIENTIFIC, Motion Picture
Abrams Instrument
Adel Precision
Bell & Howell
Eastern Science Co.
General Radio Co.
Geophysical Inst. Co.

CAMERAS, SCIENTIFIC, Photo Micro (See Microscopes, Metallographic)

CAMERAS, Television
Du Mont Labs., Inc.
Perkin-Elmer Corp.
RCA Manufacturing Co.

CAPACITANCE METERS
Aerovox Corp.
Andrew Victor J.
Assembly Products
Biddle Co., Jas. G.
Boonton Radio
Cambridge Inst. Co.
Clough-Brengle Co.
Electronic Design Corp.
General Elec. Co.
General Radio Co.
Jackson Electrical Inst.
Leeds & Northrup Co.
MacLeod & Hanopol
Panoramic Radio Co.
Premier Crystal Labs.
Radio City Products
Readrite Meter Wks.
Reiner Electronics
Rubicon Co.
Sickles Co.
Taco Engineering
Triplett Elec. Inst.

CAPACITORS, Air
Allied Radio Corp.
Andrew, Victor J.
Cambridge Inst. Co.
Cardwell Mfg. Corp.
General Radio Co.
Leeds & Northrup Co.
Millen Mfg. Co.

CAPACITORS, Electrolytic
Aerovox Corp.
Allied Radio Corp.
Cornell Dubilier
General Elec. Co.
Grammes & Sons, L. F.
Industrial Condenser
Magnavox Co.
Mallory & Co.
Potter Co.
Solar Mfg. Corp.
Tobe Deutschmann Corp.
Walker-Jimieson, Inc.
Westinghouse Elec.

CAPACITORS, Mica
Aerovox Corp.
Allied Radio Corp.
Cambridge Inst. Co.
Centralab Div.
Cornell Dubilier
Crystal Research Labs.
General Elec. Co.
General Radio Co.
Industrial Inst. Inc.
Kellogg Switchboard
RCA Manufacturing Co.
Leeds & Northrup Co.
Mallory & Co.
Potter Co.
Rubicon Co.
Sangamo Electric Co.
Sickles Co.
Solar Mfg. Corp.

CAPACITORS, Paper
Aerovox Corp.
Allied Radio Corp.
Amer. Automatic Elec.
Cornell Dubilier
Fast & Co., John E.
General Elec. Co.
General Radio Co.
Industrial Condenser
Kellogg Switchboard
Mallory & Co.
Solar Mfg. Corp.
Tobe Deutschmann Corp.

CAPACITORS, Precision
Allied Radio Corp.
Cardwell Mfg. Co.
Centralab Div.
Crystal Research Labs.
Fast & Co., John E.
General Elec. Co.
General Radio Co.
Leeds & Northrup Co.
Mallory & Co.

CAPACITORS, Variable
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Cambridge Inst. Co.
Cardwell Mfg. Co.

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General Radio Co.
Harvey Radio Labs.
Kellogg Switchboard
Leeds & Northrup Co.
Millen Mfg. Co.
Muter Co.
Rauland Corp.
Rubicon Co.

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Aerovox Corp.
Andrew, Victor J.
Assembly Products
Bernard, H. J.
Clough-Brengle Co.
Cole Instrument
Cornell Dubilier
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Industrial Inst. Inc.
Leeds & Northrup Co.
MacLeod & Hanopol
Premier Crystal Labs.
Radio City Products Co.
Readrite Meter Wks.
Rubicon Co.
Solar Mfg. Corp.
Triplett Elec. Inst.
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CARBON MONOXIDE METERS (See Gas Analyzers, Carbon Monoxide)

CARBON PILES (See Resistors, Carbon Compression)

CASES for Instruments and Tools
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Lewyt Metal Products
Rueckert Mfg.
Stafford Co.

CATHETOMETERS
Cambridge Inst. Co.
Central Scientific Co.
Dietert Co.
Eberbach & Son
Ferner Co.
Fuess, Inc.
Gaertner Scientific Corp.
Henson Co., Fred C.
Mico Instrument Co.
Welch Scientific
(Cont'd)

CATHODE RAY TUBES (See Oscillographs, Cathode Ray)

CELLS, Concentration
Fish-Schurman Corp.
Leeds & Northrup Co.
Zeiss, Inc.

CELLS, Conductivity, Electrical
Allied Controls Co.
American Inst. Co.
Cambridge Inst. Co.
Central Scientific Co.
Coleman Electric Co.
Fisher Scientific Co.
Fredericks, George
Gray Instrument Co.
Industrial Instruments
Leeds & Northrup Co.
Phoenix Prec. Inst.
Revere Co.
Sargent & Co.
Scientific Glass App.

CELLS, Conductivity, Thermal
Burrell Tech. Sup.
Cambridge Inst. Co.
Central Scientific Co.
Engelhard, Chas.
Gow-Mac Instrument Co.
Lantz-Phelps Corp.
Leeds & Northrup Co.

CELLS, Kerr
Batcher, Ralph R.
General Physical Lab.

CELLS, Photoelectric
Adair & Rhamstine
Bradley Labs.
Burt Scientific Labs.
Central Scientific
Continental Elec. Co.
Dearborn Scientific
De Jur-Amsco Corp.
Eby, Inc.
Electronic Lab.
Electronic Prod. Co.
Emby Products
Federal Telegraph Co.
Fredericks, George
General Elec. Co.
General Scientific Corp.
G-M Labs.
Hickok Elec. Inst. Co.
Kendall, James W.
Leitz, Inc.
Lumenite Elec. Co.
Pfaltz & Bauer, Inc.
Photobell Corp.
Photovolt Corp.
Rauland Corp.
RCA Manufacturing Co.
Schauer Mach. Co.
(Cont'd)

CELLS, Photoelectric (Cont'd)
United Cinephone Corp.
Vacutron, Inc.
Walker-Jimieson, Inc.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Worner Products

CELLS, Standard
Cambridge Inst. Co.
Central Scientific
Eppley Lab.
Kendall, James W.
Leeds & Northrup Co.
Rubicon Co.
Tagliabue Div.
Thwing-Albert
Weston Elec. Inst. Corp.

CEMENT APPARATUS (See Testers & Testing Machines, Cement)

CEMENTING GAGES (See Gages, Cementing)

CEMENT MOLDS
American Inst. Co.
Central Scientific Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Standard Concrete App.

CEMENT NEEDLE APPARATUS
American Inst. Co.
Central Scientific
Fisher Scientific Co.
Humboldt Mfg. Co.
Precision Scientific

CENTRIFUGES
Central Scientific
Clay-Adams Co.
Cole Instrument
Fisher Scientific Co.
Goetze Niemer Co.
International Equipment
Precision Scientific Co.
Sargent & Co.
Technical Products Co.
Williams Apparatus Co.

CENTRIFUGES, Paper Testing
International Equipment
Williams Apparatus Co.

CENTRIFUGES, Oil Testing
Boekel & Co.
Braun Corp.
Central Scientific Co.
Cole Instrument
Eclipse Aviation
International Equip.
Mueller Inst. Co.
Precision Scientific Co.
(Cont'd)

CENTRIFUGES, Oil Testing (Cont'd)
Refinery Supply
Tagliabue Div.
Thomas Co., Arthur H.
Western Machinery Co.
Westinghouse Elec. & Mfg.

CHAINS, SURVEYOR'S (See Surveying Instruments)

CHAMBERS, TEST & CALIBRATION
Aerological Developments
American Instrument Co.
Deepfreeze Division
Electric Hotpack Co.
Ideal Lab. Tool
Jewett Refrigerator
Meriam Inst. Co.
Mobile Refrigeration
Northern Labs.
Premier Crystal Labs.
Revco, Inc.
Taco Engineering
Thwing-Albert Inst. Co.
York Ice Machinery Corp.

CHECKERS, RADIO TUBE (See Analyzers, Radio Set)

CHEMICAL FEEDERS, Automatic pH Control
Askania Regulator Co.
Electronic Prod. Co.
Everson Mfg. Co.
Infilco, Inc.
International Filter Co.
Leeds & Northrup Co.
Omega Machine
Proportioneers, Inc.
Taco Engineering
Tagliabue Div.
Wallace & Tiernan

CHEMICAL FEEDERS, Dry & Liquid
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Builders-Providence
Cochrane Corp.
Colloid Equip. Co.
Fischer & Porter
Gump Co., B. F.
Infilco, Inc.
Jeffrey Mfg. Co.
Omega Machine Co.
Proportioneers, Inc.
Richardson Scale Co.
Wallace & Tiernan Prod.

CHEMICAL PORCELAIN (See Porcelain, Laboratory)

CHLORINE CONTROL APPARATUS (See Controllers, Automatic, Chlorine)

CHLORINE TESTING APPARATUS (See Testers & Testing Machines, Chlorine

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Airdesign, Inc.
Amplifier Co.
Andrew, Victor J.
Annis Co.
Clough-Brengle Co.
Control Corp.
Freed Transformer
Harvey Radio Labs.
Madison Elec. Prod.
Mallory & Co.
Martin Decker Corp.
Merit Coil
Miller Transformer
Muter Co.
Ohmite Mfg. Co.
Raytheon Mfg. Co.
Sickles Co.
Sorensen & Co.
Superior Electric Co.
Thermador Elec. Mfg.
Thordarson Elec. Co.
United Transformer Corp.

CHOKES, Precision metering, for flowtests on oilwells
Madison Elec. Prod.
Ruska Inst. Corp.

CHRONOSCOPE
Rawson Elec. Inst.
Stoelting Co., C. H.
Taco Engineering

CHRONOGRAPHS
American Inst. Co.
American Time Prods.
Aristo Import Co.
Burke, Louis
Cambridge Inst. Co.
Clebar Watch Co.
Ducommun Co.
Electro-Medical Lab.
Esterline-Angus Co.
Fecker, J. W.
Ferner Co.
Gaertner Scientific Corp.
General Elec. Co.
Gorrell & Gorrell
Jaeger Watch Co.
Jardur Import Co.
Leeds & Northrup
Metron Instrument
Pierce Watch Co.
Precision Thermometer
Roth Bros. Chronometer
Taco Engineering
Waugh Laboratories

CHRONOMETERS
Bliss & Co.
Ducommun Co.
Gaertner Scientific
(Cont'd)

CHRONOMETERS (Cont'd)
Hamilton Watch
Jardur Import Co.
Meridian Instrument
Negus, T. S. & J. D.
Roth Bros. Chronometer
Waltham Watch Co.

CIRCUIT BREAKER ANALYZERS
Cincinnati Clock & Inst.
Cole Instrument

CLASSIFIERS, Particle Size, Air
Colloid Equip. Co.
Federal Pneumatic Sys.

CLEANING MACHINES, Instrument (See Instrument Cleaning Machines)

CLINOGRAPHS, Bore Hole
Geophysical Inst. Co.
Sperry-Sun Well Survey'g

CLINOMETERS (for determining ceiling height of clouds)
Geier & Bluhm, Inc.
Leeds & Northrup
Stoelting Co., C. H.
White Co., Inc., David

CLINOMETERS, Ship
Eastern Specialty Co.
Kuner Co Max
Mueller Inst. Co.
Precision Thermometer

CLOCKS, Master
Cincinnati Time Rec. Co.
Gaertner Scientific Corp.
General Elec. Co.
Howard Clock Products
International Bus. Mach.
Kurman Electronics
Landis & Gyr, Inc.
National Time & Signal
Paragon Electric Co.
Standard Elec. Time
Stromberg Electric Co.
Telechron, Inc.
Thomas Clock Co.
Wallace & Tiernan
Waltham Watch

CLOCKS, Minute Impulse & Synchronous
Betts & Betts
Chelsea Clock Co.
Cincinnati Time Rec. Co.
Cramer & Co., Inc.
Elec. Tachometer Corp.
General Elec. Co.
Haydon Co.
Howard Clock Products
International Bus. Mach.
Kurman Electronics
National Time & Signal
Paragon Electric Co.
Standard Elec. Time Co.
Stoelting Co.
Stromberg Time Corp.
Telechron, Inc.
Thomas Clock Co.
Westinghouse Elec.
Zenith Electric Co.

CLOCKS, Primary
Chelsea Clock Co.
Cincinnati Time Rec. Co.
Eclipse-Pioneer Div.
General Elec. Co.
General Radio Co.
Howard Clock Products
International Bus. Mach.
Kurman Electronics
National Time & Signal
Roth Bros. Chronometer
Standard Elec. Time
Stromberg Time Corp.
Thomas Clock Co.
Wallace & Tiernan
Warren Telechron

CLOCKS, Secondary
American Automatic Elec.
Cincinnati Time Rec. Co.
General Elec. Co.
Howard Clock Products
International Bus. Mach.
Kurman Electronics
Landis & Gyr
National Time & Signal
Standard Elec. Time
Stromberg Time Corp.
Thomas Clock Co.
Warren Telechron

CLOCKS, Standard
Chelsea Clock Co.
Cincinnati Time Rec.
Gaertner Scientific Corp.
Jaeger Watch Co.
Kollsman Inst. Co.
Lux Clock Mfg. Co.
Roth Bros. Chronometer
Standard Elec. Time
Stromberg Time Corp.
Taco Engineering
Waltham Watch
Warren Telechron

CLOCKS, Stop
Central Scientific Co.
Clebar Watch Co.
Elgin Nat. Watch
Standard Elec. Time
Fish-Schurman Co.
Glogau & Co.
Jaeger Watch Co.
Paragon Electric Co.
Precision Scientific Co.
Roth Bros. Chronometer
Standard Elec. Time
Stoelting Co., C. H.
Tagliabue Div.
Thompson Clock Co.
Telechron, Inc.

CLOUD & POUR TEST APPARATUS
Ace Glass Inc.
American Inst. Co.
Central Scientific Co.
Corning Glass Works
Fisher Scientific Co.
Humboldt Mfg. Co.
Mueller Inst. Co.
Precision Scientific Co.
Ruehfel Co.
Scientific Inst. Co.
Scientific Glass App.
Tagliabue Div.
Western Machinery Co.

COAL METERS
Bailey Meter Co.

COIL TESTING EQUIPMENTS (See Testers, Coil)

COLLIMATORS, Vertical
Fecker, J. W.
Gaertner Scientific
Geophysical Inst. Co.
Link Aviation Devices
Perkin-Elmer Corp.
Pioneer Instrument Co.
White Co. Inc.

COLOR ANALYZERS, Photoelectric
Akatos, Inc.
Bausch & Lomb Optical
Central Scientific Co.
Dearborn Scientific
Elmer & Amend
Electric Sorting Mach.
Electronic Engineers
Electronic Laboratory
Electronic Prod. Co.
Ess Inst. Co.
Fish-Schurman Corp.
Fisher Scientific Co.
Gaertner Scientific Corp.
General Elec. Co.
General Radio Co.
Jarrell-Ash Co.
Klett Mfg. Co.
Leitz, Inc.
Madison Elec. Prod.
Pfaltz & Bauer, Inc.
Photobell Corp.
Photovolt Corp.
Pho-Tron Inst. Co.
Rawson Elec. Inst. Co.
Rubicon Co.
Saxl Instrument Co.
Sheldon Electric Corp.
United Cinephone Corp.
Westinghouse Elec.

COLOR COMPARATORS, Photoelectric (See Color Analyzers, Photoelectric)

COLOR COMPARATORS, Visual
Akatos, Inc.
Baird Associates
Bausch & Lomb Optical
Central Scientific Co.
Electronic Engineers
Electronic Research Labs.
Fisher Scientific Co.
Gaertner Scientific Corp.
Hellige, Inc.
Jarrell-Ash Co.
LaMotte Chemical Prod.
Leitz, Inc.
Macbeth Daylighting
Munsell Color Co.
Rascher & Betzold
Saxl Instrument Co.
Tagliabue Div.
Taylor & Co., W. A.
United Cinephone Corp.
Westinghouse Elec.
Zeiss, Inc., Carl

COLOR GRADERS (See Color Analyzers, Photoelectric)

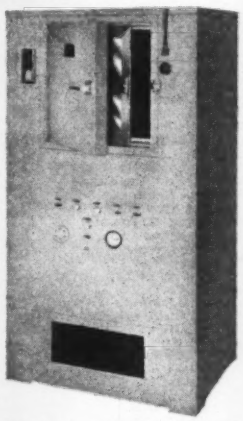
COLOR MATCHING OUTFITS (See Color Comparators, Visual)

COLORIMETER TUBES (See Colorimeters, Visual)

COLORIMETERS, Photoelectric
American Inst Co.
Associated Research
Central Scientific Co.
Clay-Adams Co.
Coleman Electric Co.
Dearborn Scientific
Electronic Engineers
Electronic Prod. Co.
Fish-Schurman Corp.
Fisher Scientific
General Elec. Co.
Higgins, Charles F.
Jarrell-Ash Co.
Klett Mfg. Co.
Leitz, Inc.
Pfaltz & Bauer, Inc.
Photobell Corp.
Photovolt Corp.
Rubicon Co.
Saxl Instrument Co.
Scientific Glass App.
Taco Engineering
Technical Products
United Cinephone Corp.
Will Corporation

COLORIMETERS, Visual
Akatos, Inc.
American Inst. Co.
American Optical
Bausch & Lomb Optical
(Cont'd)

CONTROLLED-CONDITIONS CABINET FOR WEATHERING TESTS



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COTTMAN AVENUE, AT MELROSE STREET
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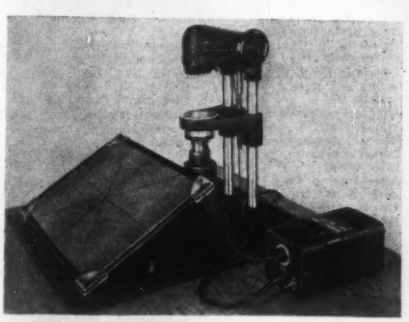
Control the job from start to finish with the

WILDER PROJECTOR



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Electronic Research Labs.
Fischer & Porter
Fish-Schurman Corp.
Fisher Scientific Co.
Jarrell-Ash Co.
Klett Mfg. Co.
Leitz, Inc.
Munsell Color Co.
Precision Scientific
Rascher & Betzold
Saxl Instrument Co.
Tagliabue Div.
Technical Products
Zeiss, Inc., Carl

COMBUSTION. Indicators and Recorders (See Gas Analyzers, Boiler Meters, etc.)

COMBUSTION CONTROL EQUIPMENT (See Controllers, Automatic-Combustion)

COMBUSTION FURNACE, Laboratory, High Temperatures, see Furnace, Laboratory

COMMUNICATION MEASURING INSTRUMENTS
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Amplifier Co.
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Ballantine Labs.
Bernard H J.
Boes Co., W. W.
Brush Development Co.
Cardwell Mfg. Co.
Clarke Inst. Corp.
Clough-Brengle Co.
Communication Meas. Lab.
Daven Co.
Electronics, Inc.
Elec. Indicator Co.
Federal Telegraph Co.
Ferris Inst. Corp.
Freed Transformer
General Elec. Co.
General Radio Co.
Harvey Radio Labs.
Hewlett-Packard
Hickok Elec. Inst. Co.
Industrial Inst. Inc.
Kellogg Switchboard
Leeds & Northrup Co.
Measurements Corp.
Precision Apparatus Co.
Premier Crystal Labs.
RCA Manufacturing Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Stafford Co.
Taco Engineering
Thordarson Elec. Mfg.
Trimount Inst. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

COMPARATORS, Mechanical
American Meas. Insts.
Baldwin Southwark
Do All Co.
Farrel-Birmingham (Gear Tooth)
Federal Prod. Corp.
Ferner Co.
Gaertner Scientific
Hathaway Inst. Co.
Henson Co., Fred C.
Mayes Mach. Sales
Metron Instrument
Mico Instrument Co.
Park Sales
Pratt & Whitney
Precision Scientific
Scherr Co., Inc.
Sheffield Corp.
Standard Gage
Swedish Gage
Vard, Inc.
Wilder, R. S.

COMPARATORS, Optical
American Meas. Insts.
Applied Research Labs.
Bausch & Lomb Optical
Cambridge Inst. Co.
DoAll Co.
Electronic Research Labs.
Ferner Co.
Fish-Schurman Corp.
Gaertner Scientific
Jarrell-Ash Co.
Jones & Lamson Mach. Lab. Specialties
Leitz, Inc.
Precision Scientific
Scherr Co., Inc.
Spencer Lens Co.
Van Keuren Co.
Zeiss, Inc., Carl

COMPARATORS, Surface Finish Standards
Surface Checking Gage

COMPASSES, Aircraft
Air-Safe Aircraft Inst.
Eclipse-Pioneer Div.
Elgin Natl. Watch Co.
General Elec. Co.
Hagedorn Engineering
Kollsman Inst. Co.
Moisture Register Co.
RCA Manufacturing Co.
Sperry Gyroscope Co.
Star Compass Co.

COMPASSES, Automobile
Star Compass Co.
U. S. Gauge Co.

COMPASSES Azimuth
Abrams Instrument
Ainsworth & Sons
Boes Co., W. W.
Keuffel & Esser Co.
Leupold & Stevens
Pioneer Instrument
Superkron Instruments
Warren-Knight Co.

COMPASSES, Dip
Gurley, W. & L. E.
Kern Co.
Keuffel & Esser Co.
Taylor Inst. Cos.
Warren-Knight Co.

COMPASSES, Drafting Room (See Drawing Instruments)

COMPASSES, Gyro
Eclipse-Pioneer Div.
General Elec. Co.
Sperry Gyroscope Co.

COMPASSES, Luminous prismatic
Kollsman Instrument
Taylor Inst. Co.
White Co., Inc., David

COMPASSES, Magnetic
Ainsworth & Sons
Baker Compass Co.
Eclipse-Pioneer Div.
General Elec. Co.
Geophysical Inst. Co.
Gurley, W. & L. E.
Kern Co.
Keuffel & Esser Co.
Kollsman Inst. Co.
Leupold & Stevens
Marshall Co.
Negus T S. & J. D.
Star Compass Co.
Taylor Inst. Cos.
Teatrite Instrument Co.
Warren-Knight Co.

COMPASSES, Marine
Baker Compass Co.
Bendix Marine Products
Bliss & Co.
Geophysical Inst. Co.
Kuner Co., Max
Marine-Compass Co.
Negus T S & J. D.
Sperry Gyroscope Co.
Star Compass Co.

COMPASSES, Radio
Boes Co., W. W.
Fisher Research Lab.
Hickok Elec. Inst. Co.
RCA Manufacturing Co.
Triumph Mfg. Co.

COMPASSES, Ship (See Compasses, Marine)

COMPASSES, Telltale (See Compasses, Marine)

COMPENSATION, Magnetic
Geophysical Inst. Co.

COMPOUNDS, Cleaning & Rinsing for Instruments (See Instrument Cleaning Machines)

COMPUTER, Simultaneous Equations
Consolidated Engineering

CONCENTRATION RECORDERS
Esterline-Angus Co.
Foxboro Co.
Leeds & Northrup

CONDENSER, Electric (See Capacitors)

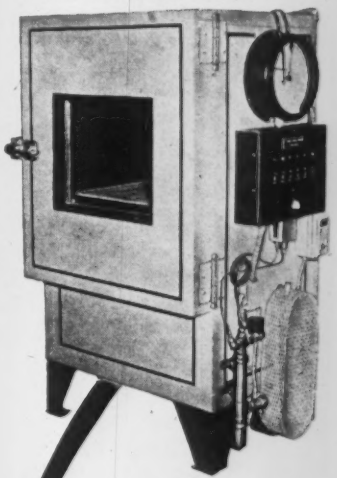
CONDENSER LEAKAGE, Indicators
Assembly Products
Associated Research
Clough-Brengle Co.
Electronic Design Corp.
General Elec. Co.
Hickok Elec. Inst. Co.
Industrial Inst. Inc.
Jackson Electrical Inst.
Kellogg Switchboard
Leeds & Northrup Co.
Potter Co.
Radio City Products Co.
Rawson Elec. Inst. Co.
Readrite Meter Wks.
Reiner Electronics
Taco Engineering
Tobe Deutschmann Corp.
Triplett Elec. Inst.
Triumph Mfg. Co.
Weston Elec. Inst. Corp.

CONDENSER LEAKAGE, Recorders
Esterline-Angus Co.
Kellogg Switchboard
Leeds & Northrup

CONDENSER TESTERS (See Testers, Condenser)

CONDUCTIVITY METERS
American Inst. Co.
Central Scientific Co
Coleman Electric Co.
Electronic Prod. Co.
Esterline-Angus Co.
Foxboro Co.
Industrial Inst. Inc.
Instrument Lab., Inc.
Kellogg Switchboard
Leeds & Northrup Co.
Natl. Aluminate Corp.
RCA Manufacturing Co.
(Cont'd)

Fortify Quality Tests with Positive Control of Conditions

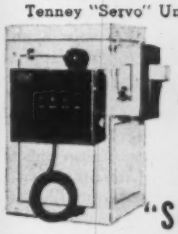


TENNEY Insulated Variable Temperature and Humidity Chamber

Positive control to close pre-selected limits is one of the reasons why leading manufacturers in many fields of industry rely on Tenney Units for testing their products. Time-honored performance in precise simulation of varied temperature, humidity and air circulation combinations bear testimony to the skillful design and careful manufacture for which Tenney Units are noted.

As an example of the control inherent in Tenney Units, conditions inside the Tenney Insulated Temperature and Humidity Chamber shown above can be varied from as low as 10% up to 95% relative humidity and held to extreme accuracy if desired. Temperature can be varied from minus 120 degrees F. to plus 200 degrees F. and held to specified limits. Controlled air circulation, without draft, provides uniform wet and dry bulb temperatures throughout the Chamber. Now used for testing products from micro-organisms to large aeroplane components and instruments.

Products Available Now—
- Tenney Insulated Temperature and Humidity Chambers
- Tenney Calibration Chambers
- Tenney Special Low Temperature Test Chambers
- Tenney Variable Temperature Liquid Baths
- Tenney "Servo" Units (shown below)



Tenney "Servo" Unit

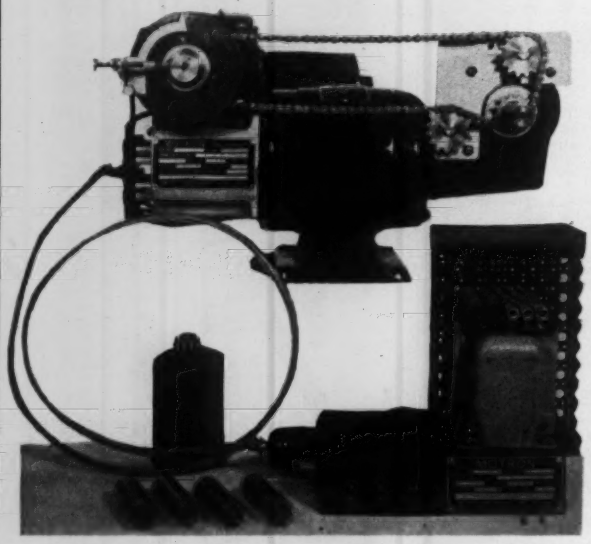
A small portable variable temperature and humidity unit for delivering "Packaged Air"—cooled, heated or humidified air—to enclosures used for testing purposes. Can be attached to impact machines, tension machines, torsion testers, cold boxes and similar equipment. Temperature range, minus 100°F. to plus 200°F.

SEND FOR SPECIAL BULLETINS

TENNEY ENGINEERING, INC.
26 Avenue B • Newark 5, N. J.
Telephone BIGELOW 8-3905
Manufacturers of Automatic Temperature, Humidity and Pressure Control Equipment

The MOTRON—

A packaged Servomechanism for automatic control that will handle short-time constant loads stable and dead-beat.



The Motron is a packaged continuous-balance control system of practically infinite sensitivity that can be applied to the automatic control or regulation of a large variety of practical problems to eliminate the need of human supervision. Several miniature vacuum tubes directly control the speed and direction of a standard 1/15 hp. induction motor, according to the setting of the input dial, which can be used to control other larger power sources.

The input-dial controls either the velocity or position of the motor to very accurate limits. The velocity in either direction may be limited from zero to maximum independent of the input-dial setting, so that hunting instability can never occur. The motor may actuate any device or mechanism, with 30-75 in. lb. torque, 0-29 rpm, that controls the process, state, or condition that is measured on the input-dial, thus controlling and regulating the process. Alternately the motor may act as a torque amplifier or remote positioning agent. Since the motor velocity, not torque, is controlled, load change or complete loss of load cannot cause instability.

The input-dial is mounted on selected precision instrument ball bearings and may be rotated by extremely small forces, such as electrical meter movements, pressure gages, flow gages, nylon or silk filaments, precision weighing balances, miniature motors and repeaters, synchronous clocks, wet paper fibres, air vanes, metal bellows or magnetic compass needles.

The Motron is designed for short time-constant systems and is usually capable of great sensitivity, .15% to .03%.

Some of the applications of the Motron are flame cutting, lathe duplicators, tensioning, guiding and winding wire, paper making, cam following, air velocity controlling and others of like nature.

An inquiry on your letterhead will bring further details.

W. C. ROBINETTE COMPANY

802 Fair Oaks Ave., South Pasadena, Calif.

CONDUCTIVITY METERS (Cont'd)
Revere Corp.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Taco Engineering
Thwing-Albert Inst. Co.

CONES, Pyrometric
Accurate Pyrometric Cone
Fish-Schurman Co.
Henderson & Co.
Orton Jr. Ceramic F'd'n
Wheelco Insts. Co.

CONES, Slump
American Inst. Co.
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Riehle Div.

CONNECTORS, Plugs, Clips, Posts, Jacks
Aero Electric Corp.
Am. Automatic Electric
American Inst. Co.
Audio Development
Autocall Co.
Automatic Elec. Sales
Breeze Corp.
Burke Electric Co.
Cannon Electric
Carter Radio Div.
Clare & Co.
Eby, Inc.
Federal Telegraph Co.
General Elec. Co.
General Radio Co.
Grammes & Sons
Jones, Howard B., Div.
Kellogg Switchboard
Mallory & Co.
Meter Devices Co.
Millen Mfg. Co.
Pyle National
RCA Manufacturing
Revere Corp.
Richards Co., Inc.
Shallcross Mfg. Co.
Standard Elec. Time
States Co.
Teleoptic Co.
Thermo-Electric Co.
Thwing-Albert Inst. Co.

CONSISTENCY REGULATORS, Pulp & Paper (See Controllers, Automatic, Consistency

CONSTANT SPEED and Frequency Sets
American Time Prods.
Andrew, Victor J.
Elec. Tachometer Corp.
Gaertner Scientific Corp.
General Elec. Co.
Leeds & Northrup
Sorensen & Co.
United Cinephone Corp.
Westinghouse Elec.
Wilson & Co.

CONTOUR MEASURING PROJECTORS
Abrams Instrument
Bausch & Lomb Optical
Buehler, Adolph I.
Ferner Co.
Fish-Schurman Corp.
Jarrell-Ash Co.
Leitz, Inc.
Scherr Co., Inc.
Wilder, R. S.

CONTROL DRIVES (See Servo-Motors)

CONTROLS, AUTOMATIC (See Controllers, Automatic)

CONTROLLERS, AUTOMATIC (See object of Measurement and Control)

"CONTROL" — NOTE —

The following pages deserve close study. Note for example that after numerous "Controllers, Automatic" there are three classes of "Controllers, Manual." Look up also under "Regulators" for many types thus termed by usage. Also "Thermostats" and other commonly-used names of specific-purpose automatic controllers.

As a rule, Automatic Controllers are "instrument-like" while devices known as Controls (preceded by name of application) are simple, single-purpose devices.

CONTROLLERS, AUTOMATIC, Ammonia (See Ammonia Control Equipment)

CONTROLLERS, AUTOMATIC, Beater (See Controllers, Automatic, Consistency)

CONTROLLERS, AUTOMATIC, Bin (see Controllers, Automatic, Granular Material, Level)

CONTROLLERS, AUTOMATIC, Boiler Feed
A-Jacks Automatic
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Campbell Co., J. A.
Combustion Control Corp.
Fisher Governor
Fischer & Porter
Foster Engg. Co.
Foxboro Co.
General Controls
Hammel-Dahl Co.
Hensley Co.
Kiely & Mueller
Leeds & Northrup
Manning, Maxwell&Moore
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller
Mercon Regulator Co.
Natural Gas Equipment
Northern Equip. Co.
Republic Flow Meters Co.
Robertshaw Thermostat
Ruggles-Klingemann
Taco Engineering
Taylor Inst. Co.
Trimount Inst. Co.
Warrick Co.
Watts Regulator Co.
Wheelco Instruments
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Boiler Water Concentration
Cochrane Corp.
Fischer & Porter
General Controls
Hensley Co.
Leeds & Northrup Co.
Manning, Maxwell&Moore
Republic Flow Meters
Taco Engineering

CONTROLLERS, AUTOMATIC, Bulk Material Level see Controllers, Automatic, Granular Material Level

CONTROLLERS, AUTOMATIC, Chlorine
Area Regulators, Inc.
Askania Regulator Co.
Builders-Providence
Cash Co.
Everson Mfg. Co.
Fischer & Porter
General Controls
LaMotte Chemical Prod.
Manning, Maxwell&Moore
National Meter Co.
Proportioneers, Inc.
Rascher & Betzold
Republic Flow Meters
Shallcross Controls
Taco Engineering
Taylor Inst. Co.
Victor Equipment Co.
Wallace & Tiernan

CONTROLLERS, AUTOMATIC, Combustion
Anderson Co.
Area Regulators, Inc.
Askania Regulator Co.
Bailey Meter Co.
Brooke Eng. Co.
Cambridge Inst. Co.
Cash Co.
Cleveland Fuel Engr.
Combustion Control Corp.
Consulting & Engineering
Denver Fire Clay Co.
Electronic Prod. Co.
Fischer & Porter
Foxboro Co.
General Combustion Corp.
General Controls
General Regulator Corp.
Hagan Corp.
Hays Corp.
Lantz-Phelps Corp.
Leeds & Northrup Co.
Mason-Neilan Reg. Co.
Minneapolis-Honeywell
National Airoil Burner
National Brass Co.
Natural Gas Equipment
Perfex Corp.
Republic Flow Meters
Samsel Time Control
Relas Company
Shallcross Controls
Taco Engineering
Taylor Inst. Co.
Worner Products

CONTROLLERS, AUTOMATIC, Condensation
Bailey Meter Co.
Boylston Co.
Cash Co.
Fisher Governor Co.
Frisz & Sons
General Controls
General Regulator Corp.
Manning, Maxwell&Moore
Photoswitch, Inc.
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Tagliabue Div.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Condenser Leakage
Foxboro Co.
Kellogg Switchboard
Leeds & Northrup Co.
Manning, Maxwell&Moore
Warrick Co.

CONTROLLERS, AUTOMATIC, Consistency
Askania Regulator Co.
Brabender Corp.
Bristol Co.
D'Este Co.
Foxboro Co.
General Controls
Mason-Neilan Regulator
McAlear Mfg.
Merritt Engr. & Sales
Northern Equip. Co.
Shallcross Controls
Taylor Inst. Co.

CONTROLLERS, AUTOMATIC, Counting
Abrams Instrument
Adde & Co.
Automatic Elec. Sales
Automatic Temp. Control
Bristol Co.
Eagle Signal Corp.
Lumenite Electric Co.
Manning, Maxwell&Moore
National Time & Signal
Paragon Electric Co.
Photoswitch, Inc.
RCA Manufacturing Co.
Standard Electric Time
Taco Engineering
United Cinephone Corp.

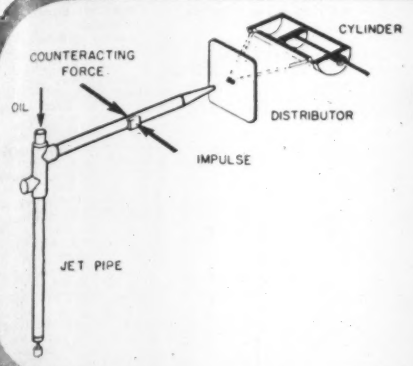
CONTROLLERS, AUTOMATIC, Current (See Regulators)

CONTROLLERS, AUTOMATIC, Cycle
Abrams Instrument
Adde & Co.
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Barber Colman
Betts & Betts
Bristol Co.
Brown Inst. Co.
Cramer Co., Inc.
Denver Fire Clay Co.
Elec. Switch Corp.
Fisher Governor
Fisher-Pierce Co.
Foxboro Co.
General Controls
General Elec. Co.
Hagan Corp.
Hanlon-Waters, Inc.
Industrial Timer Corp.
Leeds & Northrup Co.
Manning, Maxwell&Moore
Mason-Neilan Reg. Co.
Minneapolis-Honeywell
Monitor Controller Co.
National Time & Signal
Paragon Electric Co.
Seely Inst Co., Inc.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Damper
A-Jacks Automatic
Area Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Beck Co.
Bellfield Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Cleveland Fuel Engr.
Cook Electric Co.
Davis Reg. Co.
Denver Fire Clay Co.
Electronic Prod. Co.
Fisher Governor
Foster Eng. Co.
Foxboro Corp.
Fri & Sons, Julius
Fulton Syphon Co.
General Controls
Gleason-Avery, Inc.
Hagan Corp.
Hanlon-Waters, Inc.
Hays Corp.
Johnson Service Co.
Kiely & Mueller
Leeds & Northrup Co.
Mason-Neilan Regulator
Manning, Maxwell&Moore
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
Penn Electric Switch Co.
Perfex Corp.
Powers Regulator Co.
Preferred Utilities Mfg.
Republic Flow Meters
Robinette Co., W. C.
Ruggles-Klingemann
Samsel Time Control
Schade Valve Mfg. Co.
Shallcross Controls
Spence Eng. Co., Inc.
Taco Engineering
Tagliabue Div.
Taylor Instrument Cos.
Watts Regulator Co.
White-Rodgers Electric
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Density
Acme Regulator Co.
Area Regulators, Inc.
Askania Regulator Co.
Automatic Valve Control
Bailey Meter Co.

(Cont'd)



This Simple Principle Offers Unlimited Control Applications

The jet pipe principle is the basis of all Askania hydraulic control systems. The inherent advantages of this principle have brought to the nation's major industries a control system of noteworthy sensitivity . . . simplicity . . . and thus uninterrupted service. These features make the control ideal for an unlimited field of control applications . . . some of which are listed. We shall be pleased to discuss your problem specifically.

ASKANIA REGULATOR CO.
1605 S. Michigan Ave.
Chicago, Illinois

ASKANIA
REGULATOR CO. CHICAGO
AUTOMATIC CONTROL

FOR EVERY BRANCH OF INDUSTRY

CHEMICAL INDUSTRY
Chlorine suction control
Hydrogen suction control
Proportioning control
Pressure control

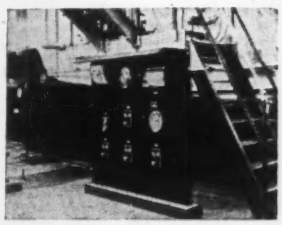
POWER PLANTS
Boiler combustion control
Pressure reducing
Prime mover control

STEEL PLANTS
Blast furnace
Air flow control of blowing engines
Combustion control of hot blast stove burners
Gas pressure control.
Open hearth furnace
Furnace pressure control
Combustion control
Control of multi-fuels
Automatic reversal control
Soaking pit
Furnace pressure control
Combustion control
Reheating and heat treating furnace
Furnace pressure control
Combustion control

GLASS PLANTS
Furnace pressure control
Fuel-air ratio control
Gas pressure control

GAS PLANTS
Gas mixing control
Exhauster control
Booster control
Collecting-main pressure control
Stack-draft control
Oven fuel gas pressure control

Askania alone has the Jet Pipe Principle



BAILEY METER *Combustion* CONTROL

● Bailey Meter Automatic Combustion Control of boilers results in substantial saving in fuel; increased boiler capacity; reduction of boiler and furnace maintenance; more time for operators to devote to general station maintenance; and improvement in the general character of service.

Bailey Meter Control makes possible the everyday operation of boilers at test efficiencies because it is a complete combustion control system which (1) automatically maintains steam pressure by supplying fuel and air simultaneously to boilers in accordance with changes in steam demand, (2) automatically maintains most economical fuel-air ratio by incorporating the Bailey Boiler Meter as an integral part of the system, (3) automatically maintains the desired furnace draft, and (4) automatically distributes load among boilers so that each unit carries its share.

This sturdy inexpensive air-operated control system has been applied to all sizes and types of boilers ranging from 200 h.p. upward. It is applicable to all fuels and all methods of firing.

For further information consult Sweet's Engineering Catalogs or write for bulletin No. 102-C.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

AUTOMATIC CONTROL INSTRUMENTS

Both electric and pneumatic controllers for temperature, pressure, vacuum, draft, liquid level, flow, pH, humidity, complete coordinated process controls engineered for all variables of your process, including automatic timing of mechanical operations according to the desired schedule. Write for bulletins 512 and 572. The Bristol Co., 113 Bristol Road, Waterbury 91, Conn.

BRISTOL

ENGINEERS PROCESS CONTROL FOR BETTER PRODUCTS AND PROFITS

Wheelco Flame-otrols Combustion Safeguards

Wheelco Flame-otrols provide safety against combustion explosions resulting from flame failure. Flame-otrols also prevent entry of fuel into the combustion chamber until adequate means are provided for establishing ignition.

The Flame-otrol combustion safeguard is approved by both Underwriters' Laboratories and Associated Factory Mutual Laboratories.

Complete description given in Bulletin No. L2
Write for your copy, today.

Wheelco Instruments Company
HARRISON AND PEORIA STREETS . CHICAGO 7, ILL.

PROTECTOGLO
Combustion Safeguard System

Flame-Electrode System for Gas

The Brown Protectoglo Flame-Electrode System is a complete combustion safeguard which stops the flow of gas to the burner or pilot in the event of flame failure. The system is based on the electrical conductivity of flame. The flame itself forms a part of the electrical circuit which, through a relay, holds open a valve in the gas line. Failure of the flame interrupts the current, causing the relay to fall out, closing the valve. In addition, the Protectoglo System can operate other devices such as bells or alarms, and with a timer or air switch, it provides for positive air purge.

Photo-Electrode System for Oil and Other Luminous Flames

The Brown Photo-Electrode System operates by means of a photo-electric cell which focuses on the luminous flame. A sensitivity adjustment assures positive protection and enables the unit to differentiate between the flame itself and hot surrounding brickwork. This system is also designed to operate with auxiliary safety devices, where desired.

THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

Protectoglo SYSTEM

Air-Actuated
REMOTE RECORDER *and* **CONTROLLER**

Automatically charts—at a point remote from meter installation—the volume of gas, air, steam or fluid measured by orifice method.

Write for Bulletin E-22 containing detailed specifications.

2178

AMERICAN METER COMPANY
60 EAST 42nd STREET, NEW YORK 17, N. Y.

CONTROLLERS, AUTOMATIC, Density (Cont'd)
Ess Instrument Co.
Foxboro Co.
General Controls
Lumenite Electric Co.
Manning, Maxwell&Moore
Mine & Smelter Supply
Moore Products
Republic Flow Meters
Shallcross Controls
Tagliabue Div.
Taylor Instrument Cos.

CONTROLLERS, AUTOMATIC, Desuperheat
Area Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Foxboro Corp.
Hagan Corp.
Leeds & Northrup Co.
Manning, Maxwell&Moore
Mason-Neilan Regulator
Mercoid Regulator Co.
Northern Equip. Co.
Republic Flow Meters Co.
Spence Eng. Co., Inc.
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.

CONTROLLERS, AUTOMATIC, Draft
A-Jacks Automatic
Area Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Beck Co.
Boiler Room Equip.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
Cleveland Fuel Engr.
Denver Fire Clay Co.
Foster Eng. Co.
Foxboro Co.
Frisz & Sons, Julien
General Controls
General Regulator Corp.
Gleason-Avery, Inc.
Hagan Corp.
Hays Corp.
Leeds & Northrup Co.
Manning, Maxwell&Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
National Airoil Burner
National Brass Co.
Preferred Utilities Mfg.
Perfex Corp.
Republic Flow Meters
Robinette Co., W. C.
Ruggles-Klingemann
Samsel Time Control
Seely Inst. Co., Inc.
Shallcross Controls
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Feed Water
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Belfield Co.
Brown Inst. Co.
Campbell Co., J. A.
Fisher Governor
Fischer & Porter
General Controls
Hagan Corp.
Hanlon-Waters, Inc.
Hensley Co.
Kiely & Mueller
Leslie Co.
Lumenite Co.
Manning, Maxwell&Moore
Mason-Neilan Reg. Co.
McAlear Mfg. Co.
McDonnell & Miller
Mercoid Regulator Co.
Natural Gas Equipment
Northern Equip. Co.
Republic Flow Meters
Ruggles-Klingemann
Schade Valve Mfg. Co.
Simplex Valve & Meter
Taco Engineering
(Cont'd)

CONTROLLERS, AUTOMATIC, Feed Water (Cont'd)
Taylor Inst. Co.
Trimount Inst. Co.
Watts Regulator Co.
Wheelco Instruments
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Filter Rate
Builders-Providence
Cochrane Corp.
Fisher & Porter
Foxboro Co.
Infilco, Inc.
Manning, Maxwell&Moore
Mason-Neilan Reg. Co.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.
Warrick Co.

CONTROLLERS, AUTOMATIC, Float
Allen-Bradley Co.
Autocall Co.
Automatic Control Co.
Bailey Meter Co.
Belfield Co.
Bristol Co.
Builders-Providence
Campbell Co., J. A.
Cash Co.
Cochrane Corp.
Cutler-Hammer, Inc.
Davis Regulator Co.
General Controls
Fischer & Porter
Fisher Governor
Furnas Electric Co.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Hagan Corp.
Hanlon-Waters, Inc.
Kiely & Mueller
Klipfel Mfg.
Leupold & Stevens
Lumenite Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercoid Regulator Co.
Moore Products
Northern Equipment
Penn Electric Switch
Positel Mfg. Co.
Powers Regulator Co.
Republic Flow Meters
Ruggles-Klingemann
Schade Valve Mfg. Co.
Shallcross Controls
Simplex Valve & Meter
Spence Eng. Co., Inc.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Water Level Controls Co.

CONTROLLERS, AUTOMATIC, Flow
Adel Precision
American Meter Co.
Area Regulators, Inc.
Askania Regulator
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Beck Co.
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Builders-Providence
Cash Co.
Cook Electric
Cutler-Hammer, Inc.
Davis Regulator
Denver Fire Clay Co.
Electrimatic Corp.
Electronic Engineers
Fischer & Porter
Foster Engg. Co.
Foxboro Co.
Fulton Sylphon Co.
General Controls
General Regulator Corp.
Hagan Corp.
Hanlon-Waters, Inc.
Hays Corp.
Hensley Co.
Infilco, Inc.
Leeds & Northrup Co.
Leslie Co.
Leupold & Stevens
Magnatrols, Inc.
Mallory & Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercoid Regulator Co.
(Cont'd)

CONTROLLERS, AUTOMATIC, Flow (Cont'd)
Moore Products
Northern Equipment
Process Controls, Inc.
Proportioneers, Inc.
Republic Flow Meters
Ring Balance Inst.
Robinette Co., W. C.
R-S Prod. Corp.
Shallcross Controls
Simplex Valve & Meter
Spence Eng. Co., Inc.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trimount Inst. Co.
Victor Equipment Co.
Wheelco Instruments
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Flow Proportioning
American Meter Co.
Area Regulators, Inc.
Askania Regulator Co.
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Beck Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Builders-Providence
Cash Co.
Cochrane Corp.
Cutler-Hammer, Inc.
Electronic Engineers
Electronic Prod. Co.
Fischer & Porter
Foxboro Co.
Fulton Sylphon Co.
General Controls
General Regulator Corp.
Hagan Corp.
Hanlon-Waters, Inc.
Hays Corp.
Hensley Co.
Illinois Engr. Co.
Infilco, Inc.
Lammert & Mann Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercoid Regulator Co.
Proportioneers, Inc.
Republic Flow Meters Co.
Reynolds Gas Regulator
Ring Balance Inst.
R-S Prod. Corp.
Simplex Valve & Meter
Shallcross Controls
Sparling, R. W.
Spence Engr. Co., Inc.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Victor Equipment Co.
Wallace & Tiernan
Wheelco Inst. Co.

CONTROLLERS, AUTOMATIC, Fluid Proportioning
(See Controllers, Automatic, Flow Proportioning)

CONTROLLERS, AUTOMATIC, Frequency
(See Regulators)

CONTROLLERS, AUTOMATIC, Furnace
Abrams Instrument
A-Jacks Automatic
Am. Gas Furnace Co.
Area Regulators, Inc.
Askania Regulator Co.
Automatic Elec. Mfg. Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Beck Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Burling Instrument Co.
Cash Co.
Cleveland Fuel Engr.
Cook Electric Co.
Defender Automatic Reg.
Denver Fire Clay Co.
Dickson Co.
Electronic Prod. Co.
Fischer & Porter
Foxboro Co.
Fulton Sylphon Co.
General Controls
General Elec. Co.
(Cont'd)

CONTROLLERS, AUTOMATIC, Furnace (Cont'd)
General Regulator Corp.
Gleason-Avery, Inc.
Gordon Co., Claud S.
Hagan Corp.
Hays Corp.
Industrial Engr. Corp.
Johnston Mfg. Co.
Leeds & Northrup
Manning, Maxwell&Moore
Marsh Corp.
Mason-Neilan Regulator
McCorkle Co.
Minneapolis-Honeywell
Modern Kiln & Furn.
National Airoil Burner
National Brass Co.
Natural Gas Equipment
Paragon Electric Co.
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Pgh. Equitable Meter
Pyrometer Inst. Co.
Republic Flow Meters
Robinette Co., W. C.
R-S Prod. Corp.
Ruggles-Klingemann
Samsel Time Control
Shallcross Controls
Spence Engineering Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Thwing-Albert Inst. Co.
United Clinphone Corp.
United Elec. Controls
Westinghouse Elec.
Wheelco Inst. Co.
White Mfg. Co.
White-Rodgers Electric
Wilgus Mfg. Co.
Wood, Harry W.

CONTROLLERS, AUTOMATIC, Gas Density
Askania Regulator Co.
Bailey Meter Co.
General Controls
Moore Products
Refinery Supply Co.
Shallcross Controls

CONTROLLERS, AUTOMATIC, Gas Mixing
(See Controllers, Automatic, Flow Proportioning)

CONTROLLERS, AUTOMATIC, Granular Material Level
Askania Regulator Co.
Bin-Dicator Co.
Electronic Prod. Co.
Fuller Co.
General Controls
Infilco, Inc.
Merrick Scale
Mosher Electronic
Photoswitch, Inc.
Robinette Co., W. C.
Shallcross Controls
Stephens-Adamson
Taco Engineering
Wheelco Instruments

CONTROLLERS, AUTOMATIC, Granular Material, Weight
Builders-Providence
General Controls
Merrick Scale
Omega Machine
Taco Engineering

CONTROLLERS, AUTOMATIC, Gravity
Area Regulators, Inc.
Askania Regulator Co.
Bailey Meter Co.
Bristol Co.
Cash Co.
Ess Instrument
Foxboro Co.
Manning, Maxwell&Moore
Mason-Neilan Regulator
Mine & Smelter Supply
Moore Products
Republic Flow Meters
Shallcross Controls
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.

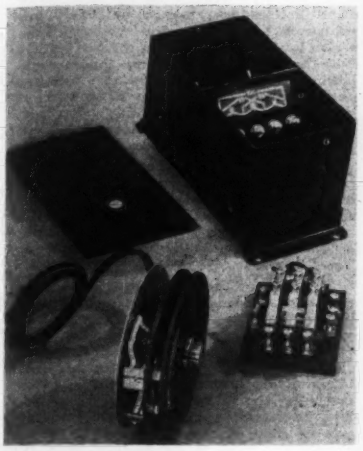
CONTROLLERS, AUTOMATIC, Humidity
American Inst. Co.
American Moistening Co
Area Regulators, Inc.
Atlas Valve Co.
Barber-Colman Co.
(Cont'd)

Controllers FOR AUTOMATIC REGULATION OF TEMPERATURE, COMBUSTION, pH, ETC.

Sensitive, dependable and accurate Controllers made by L&N are widely used throughout industry. Micromax and Speedomax recording and indicating Controllers; Metermax and Type P Combustion Controllers; Furnace Pressure Controllers and Roof Temperature Controllers for industrial furnaces; L&N Load-Frequency Controllers all warrant careful investigation. Catalogs on request.

LEEDS & NORTHRUP CO. 4984 STENTON AVE., PHILADELPHIA 44, PA.
MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

"Wee" PROPORTIONING CONTROL



ADAPTS standard two-position temperature controllers for "straight-line" controlling of fuel or electric fired furnaces, thermocouple checking furnaces, and tower tops.

TWO OPPOSED temperature sensitive elements eliminate control "dead-space", provide throttling range, and enable the instrument to *automatically* adjust input for distance from control point, rate of approach toward control point, and load change.

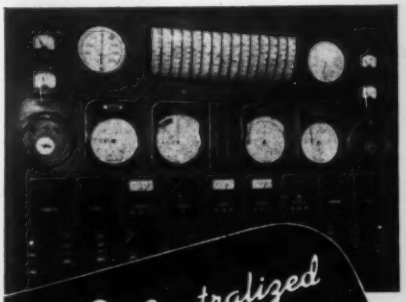
THIS IS DONE without affecting instrument accuracy, changes in external wiring or controls, vacuum tubes, timing devices, or external manual adjustments.

STANDARD KITS now available for users of Leeds & Northrup pyrometers having own instrument department at $55.00 each. Installed price $75.00 each for Leeds & Northrup controllers at Pyrometer Service Shop. Other makes on request.

Pyrometer Service Co.

228 River Road

North Arlington, N. J.



HAYS *Centralized* AUTOMATIC COMBUSTION CONTROL

The All-Electric System

OPERATED entirely by electricity, the Hays system of Automatic Combustion Control is simple to install and maintain, easy to understand and operate. Has full provision for remote manual operation. A positive "must" for conserving fuel and man power—read all about it in Bulletin 46-448 sent free on request.

The HAYS CORPORATION

COMBUSTION CONTROL

All Sizes of Boilers
All Types of Firing

Republic-Smoot combustion control systems are designed for all sizes of boilers and all types of fuel firing equipment.

CONSTANT STEAM PRESSURE
Automatically maintains a constant steam pressure by controlling the fuel and air input to the boilers in balance with the boiler load.

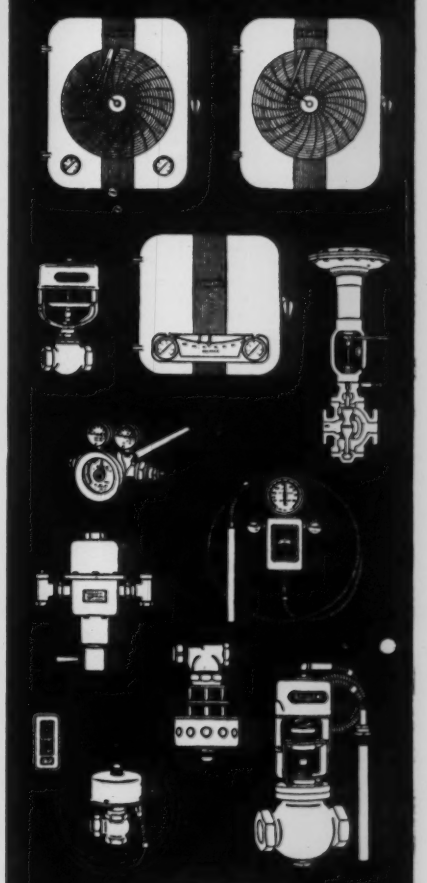
EFFICIENT COMBUSTION
Automatically maintains maximum combustion efficiency over entire range of boiler rating, by controlling simultaneously the fuel and air input to boiler in measured proportions and in a fixed ratio.

LOAD DISTRIBUTION
Automatically distributes load equally among all the boilers, or the load can be distributed between the boilers as desired.

WRITE FOR DATA BOOK No. S-21

REPUBLIC FLOW METERS CO.
2249 DIVERSEY PKWY., CHICAGO, ILLINOIS

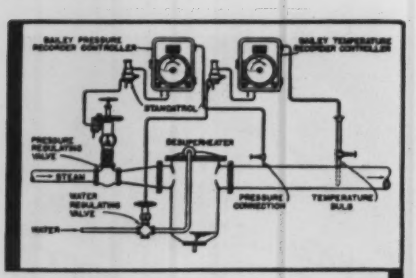
POWERS TEMPERATURE and HUMIDITY **CONTROL**



When you want accurate and dependable automatic temperature or humidity control for Industrial Processes, Heating or Air Conditioning Systems, call in a Powers engineer. With over 50 years of experience and a very complete line of self-operating and air operated controls we are well equipped to fill your requirements.

Write for Circular 2520
2734 Greenview Ave., Chicago
Offices in 47 Cities—See your phone directory.

THE POWERS REGULATOR CO.



DESUPERHEATING & PRESSURE REDUCING CONTROL

● Bailey Meter Control of desuperheating and pressure reducing incorporates standard Bailey Recorder-Controllers for both pressure and temperature, as well as a special Bailey Reducing Valve equipped with valve positioner and air cooled packing gland.

The control system is air-operated and is arranged to maintain the desired final steam temperature by controlling the quantity of water fed to a cartridge type desuperheater. This temperature is measured by a sensitive bare bulb temperature recorder-controller with the temperature bulb located at the ● outlet of the desuperheater.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

"Electronic Principle" Temperature Controllers

Wheelco offers a complete line of Temperature Controllers, employing the famous *"Electronic Control Principle"*.

"Electronic Principle" Controllers include:

CAPACITROLS—Pyrometer Controllers

POTENTIOTROLS—Potentiometer Controllers

RESISTANCE THERM-OTROLS—Indicating Resistance Thermometer Controllers

LIMITROLS—Automatic Temperature Shut-off

PROGRAM CONTROLLERS

PROPORTIONING CONTROLLERS

Request free literature

Wheelco Instruments Company
HARRISON AND PEORIA STREETS · CHICAGO 7, ILL.

Bailey FEED WATER Control

● Bailey Meter Company offers three distinct feed water control systems. They are (1) the Thermo-hydraulic Feed Water Regulator which is suitable for the majority of small boilers operating at relatively low pressures. This regulator operates from water level alone and is provided with a fully balanced tight seating V-port regulating valve designed to give a straight line characteristic. It offers the advantages of low installation cost, removable valve parts and independence of valve location.

(2) The Single-Element air-operated feed water control system is recommended for installations on which smooth regulation of feed water flow is desired, and a wide regulating range cannot be used. This system is controlled by water level alone as measured by a Bailey Boiler Drum Water Level Recorder.

(3) Bailey Three-Element feed water control is recommended for high capacity low water storage boilers operating at high pressures or for boilers operating at medium pressures with violent load fluctuations. This system is based on actual measurement of water flow to the boiler, steam flow from the boiler and water level within the boiler, and is adjusted primarily to control the rate of water flow to the boiler so that it equals the rate of steam flow from the boiler.

For detailed information consult Sweet's Engineering Catalogs or request bulletin ● No. 105-A.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

CONTROLLERS, AUTOMATIC, Humidity (Cont'd)
Brabender Corp.
Bristol Co.
Brown Inst. Co.
Cramer & Co., Inc.
Dietert Co.
Electronic Engineers
Electronic Prod. Co.
Fenwal, Inc.
Foxboro Co.
Friez & Sons
General Controls Co.
Gotham Inst. Co.
H-B Inst. Co., Inc.
Johnson Service Co.
Leeds & Northrup Co.
Manning, Maxwell&Moore
Mason-Neilan Regulator
McDonnell & Miller
Mine Safety Appliance
Minneapolis-Honeywell
Moeller Instrument Co.
Moisture Register Co.
Norcross Laboratories
Parks-Cramer Co.
Penn Electric Switch
Phila. Thermometer Co.
Powers Regulator Co.
Robertshaw Thermostat
Samsel Time Control
Sarco Co., Inc.
Scientific Inst. Co.
Supreme Elec. Prods.
Taco Engineering
Tagliabue Div.
(Cont'd)

CONTROLLERS, AUTOMATIC, Humidity (Cont'd)
Taylor Inst. Cos.
Thwing-Albert Inst. Co.
Trerice Co., H. O.
United Elec. Controls
Valverde Labs.
Vaughn-G. E. Witt Co.
Wexler Thermometer
Wheelco Insts. Co.
White Rodgers Elec.
Wood, Harry W.
Zeiss, Inc., Carl

CONTROLLERS, AUTOMATIC, Humidity and Temperature (See Controllers, Automatic, Humidity and Controllers, Automatic, Temperature)

CONTROLLERS, AUTOMATIC, Lighting
Abrams Instrument
American Radio Co.
Automatic Elec. Mfg.
Betts & Betts
Cutler-Hammer, Inc.
Fisher-Pierce Co.
General Controls
General Elec. Co.
Lumenite Co.
Paragon Electric Co.
Photoswitch, Inc.
United Cinephone Corp.
(Cont'd)

CONTROLLERS, AUTOMATIC, Lighting (Cont'd)
United Transformer
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.
Zenith Electric Co.

CONTROLLERS, AUTOMATIC, Liquid Level
Allen-Bradley Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Bastian-Blessing Co.
Belfield Co.
Bin-Dicator Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
B. W. Controller
Cash Co.
Cochrane Corp.
Control Corp.
Cook Electric
Cutler-Hammer, Inc.
Davis Reg. Co.
Defender Automatic Reg.
Electronic Prod. Co.
D'Este Division
(Cont'd)

CONTROLLERS, AUTOMATIC, Liquid Level (Cont'd)
Elec. Indicator Co.
Fisher Governor Co.
Fisher-Pierce Co.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Friez & Sons
Fuller Co.
General Controls Co.
General Electric Co.
General Regulato. Corp.
Guardian Elec. Mfg. Co.
Hagan Corp.
Hanlon-Waters, Inc.
Hays Corp.
Henszey Co.
Inferno Co.
Infilco, Inc.
Johnson Service Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leeds & Northrup Co.
Leupold & Stevens
Lumenite Elec. Co.
Magnatrols, Inc.
Manning, Maxwell&Moore
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products Co.
Morey & Jones, Ltd
(Cont'd)

CONTROLLERS, AUTOMATIC, Liquid Level (Cont'd)
Natural Gas Equipment
Northern Equip. Co.
Paragon Electric Co.
Penn Electric Switch
Petrometer Corp.
Photoswitch, Inc.
Positel Mfg. Co.
Powers Regulators Co.
Precision Therm.
Reliance Gauge Column
Republic Flow Meters
Rowan Controller Co.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Shallcross Controls
Simplex Valve & Meter
Sparling, R. W.
Spence Engineering Co.
Stephens-Adamson
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trimount Inst. Co.
United Cinephone Corp.
United Electric Controls
Warrick Co.
Water Levels Controls Co.
Watts Regulator Co.
Wheelco Inst. Co.
Wilgus Mfg. Co.
Wood, Harry W.

CONTROLLERS, AUTOMATIC, Load (See Regulators)

CONTROLLERS, AUTOMATIC, Moisture (See Controllers, Automatic, Humidity)

CONTROLLERS, AUTOMATIC, pH
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Foxboro Co.
General Controls
Leeds & Northrup
Taco Engineering

CONTROLLERS, AUTOMATIC, Phase (See Regulators)

CONTROLLERS, AUTOMATIC, Power Factor (See Regulators)

CONTROLLERS, AUTOMATIC, Pressure & Vacuum
Acme Regulator Co.
Allen-Bradley Co.
American Meter Co.
Area Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Bailey Meter Co.
Baldwin-Southwark Corp.
(Cont'd)

TAG CONTROLLERS

Wherever the control of plant operations presents a production problem, TAG Automatic Controllers of either the electrical or air-operated types offer competent solution. These TAG Instruments have opened the way to better processing methods by more precise control of temperature, pressure and the time in which they act. Write for catalogs.

PORTABLE PRODUCTS CORPORATION
C. J. TAGLIABUE DIVISION 549 PARK AVE., BROOKLYN 5, N. Y.

TAG

CONTROLLERS, AUTOMATIC, Pressure & Vacuum (Cont'd)

Barber-Colman
Bastian-Blessing Co.
Beck Co.
Beifield Co.
Boekel & Co.
Boylston Co.
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Builders-Providence
Cash Co.
Cleveland Fuel Engr.
Connelly Iron Sponge Co.
Cook Electric
Cutler-Hammer, Inc.
Davis Reg. Co.
D'Este Co.
Dickson Co.
Distillation Products
Eclipse Fuel Engg.
Electronic Engineers
Electronic Prod. Co.
Emerson Apparatus Co.
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
Fredericks, George
Friez & Sons
Fulton Sylphon Co.
Furnas Electric Co.
Gas. Appl. Specialties
General Controls Co.
General Electric Co.
General Regulator Corp.
Gen. Sales & Prod.
Gotham Inst. Co.
Hagan Corp.
Hammel-Dahl Co.
Hawk Tool & Engr.
Hanion-Waters, Inc.
Hays Corp.
H & H Thermostats
Hoke, Inc.
Hydraulic Press Co.
Illinois Engg. Co.
Kiely & Mueller
Klipfel Mfg. Co.
Lammert & Mann Co.
Leeds & Northrup Co.
Leslie Co.
Manning, Maxwell&Moore
Marsh Corp.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Meletron Corp.
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products
Mu-Switch Corp.
Nason Co.
National Time & Signal
Natural Gas Equip. Inc.
Northern Equip. Co.
Penn Electric Switch
Perfex Corp.
Pgh. Equitable Meter
Powers Regulator Co.
Precision Therm.
Ranco Inc.
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Robinette Co., W. C.
Ruggles Klingemann
Samsel Time Control
Schade Valve Mfg. Co.
Schwien Eng. Co.
Scientific Inst. Co.
Seely Instrument Co.
Selas Co.
Shallcross Controls
Spence Engineering Co.
Sterling Eng. Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co., H. O.
Trimount Inst. Co.
United Elec. Controls
Uehling Instrument Co.
Vapor Recovery Systems
Vaughn-G. E. Witt Co.
Victor Equipment Co.
Wallace & Tiernan
Ward Leonard Elec. Co.
Water Level Controls Co.
Watts Regulator Co.
Waugh Laboratories
Wheelco Inst. Co.
White-Rodgers Electric
Wilgus Mfg. Co.
Wood, Harry W.

CONTROLLERS, AUTOMATIC, Pyrometric
Am. Gas Furnace Co.
Ashcroft Auto. Cont.
Askania Regulator Co.
Automatic Temp. Control
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Burling Inst. Co.
Dickson Co.
Electronic Lab.
Electronic Prod. Co.
Engelhard, Chas.
Ferner Co.
Foxboro Co.
General Elec. Co.
G-M Labs
Hoskins Mfg. Co.
Ill. Testing Labs.
Klipfel Mfg.
Leeds & Northrup Co.
Lewis Engg. Co.
Lindberg Eng. Co.
(Cont'd)

CONTROLLERS, AUTOMATIC, Pyrometric (Cont'd)

Manning, Maxwell&Moore
Mason-Neilan Regulator
Partlow Corp.
Perfex Corp.
Pyrometer Instrument Co.
Pyrometer Service Co.
Revere Corp.
Robinette Co., W. C.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Thwing-Albert Instrument
Uehling Instrument Co.
Wheelco Inst. Co.

CONTROLLERS, AUTOMATIC, Radio Remote
Am. Automatic Electric
Cardwell Mfg. Co.
Guardian Elec. Mfg. Co.
Hastings Inst. Co.
Lewyt Metal Prod.
McFarlin Co.
Metron Instrument
Polarad Electronics
RCA Manufacturing Co.
Sorensen & Co.
United Cinephone Corp.
Wallace & Tiernan
Yardeny Engineering Co.

CONTROLLERS, AUTOMATIC, Rate-Volume (See Controllers, Automatic, Flow)

CONTROLLERS, AUTOMATIC, Refrigeration
Allen-Bradley Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Brown Inst. Co.
Burling Instrument Co.
Cash Co.
Cutler-Hammer, Inc.
D'Este Co.
Dickson Co.
Electrimatic Corp.
Frick Co.
Friez & Sons, Julien
Fulton Sylphon Co.
General Controls Co.
General Elec. Co.
Illinois Engr. Co.
Lumenite Elec. Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercoid Corp.
Minneapolis-Honeywell
Penn Electric Switch
Perfex Corp.
Phila. Thermometer Co.
Pgh. Equitable Meter
Ranco, Inc.
Refrigerating Spec. Co.
Sarco Co., Inc.
Schade Valve Mfg. Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
United Elec. Controls
White-Rodgers Electric

CONTROLLERS, AUTOMATIC, RKVA (See Regulators)

CONTROLLERS, AUTOMATIC, Specific Gravity (See Controllers, Automatic, Gravity)

CONTROLLERS, AUTOMATIC, Speed (See Tachometric below)

CONTROLLERS, AUTOMATIC, Stoker (See Controllers, Automatic, Furnace)

CONTROLLERS, AUTOMATIC, Strain-Rate & Stress-Rate
Bailey Meter Co.
Baldwin-Southwark Corp.
Taco Engineering

CONTROLLERS, AUTOMATIC, Synchronizing (See Regulators)

CONTROLLERS, AUTOMATIC, Tachometric
Abrams Instrument
Allen-Bradley Co.
Askania Regulator Co.
Automatic Temp. Control
Bailey Meter Co.
Barbour Stockwell Co.
Bristol Co.
Brown Inst. Co.
Cutler-Hammer, Inc.
Foxboro Co.
General Elec. Co.
General Regulator Corp.
Hagan Corp.
Leeds & Northrup
Mason-Neilan Regulator
Metron Instrument
Moisture Register Co.
Monitor Controller Co.
Republic Flow Meters
Robinette Co., W. C.
Shallcross Controls
Taco Engineering
Westinghouse Elec.

CONTROLLERS, AUTOMATIC, Temperature (See Pyrometric above or Thermometric below)

NULLMATIC

PNEUMATIC "NULL" BALANCE

INSTRUMENTS

for measurement and transmission of

PRESSURE

TEMPERATURE

FLOW

LIQUID-LEVEL

SPECIFIC GRAVITY

•

Write for Catalog No. 5

which shows these NULLMATIC circuits, and also describes the

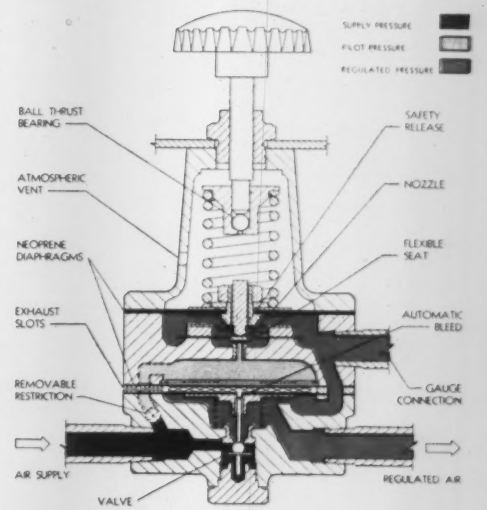
MOORE VALVE POSITIONER and the MOORE LIQUID-LEVEL CONTROLLER

(Packless Flexible Shaft Type)

THIS "NULL" SYSTEM IS EMPLOYED IN

THE NULLMATIC PRESSURE REGULATOR

— a pressure controller, which maintains the regulated pressure at the set value, *regardless of wide changes in flow or in supply pressure.*



APPLICATIONS—(1) For remote manual control of air-operated valves or air-loaded cylinders. A manual-automatic control panel, with by-pass, is available. (2) For general laboratory use. (3) In calibration departments, for setting and maintaining manometer readings. (4) Wherever precision regulation of air or gas pressure is required.

STANDARD RANGES

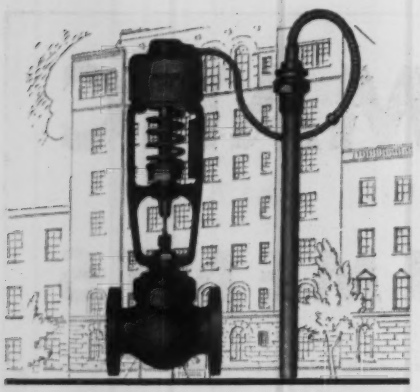
0 to 50" H_2O
0 to 15 p.s.i.
0 to 30 p.s.i.
10 to 50 p.s.i.
20 to 100 p.s.i.

Bulletin 402 shows graphs of performance data.

NULLMATIC Regulators can be furnished for **VACUUM APPLICATIONS**

MOORE PRODUCTS CO.

912 E. Lycoming Street, Philadelphia 24, Pa.



What is HOT water?

The cost of maintaining hot water service may be very high—especially if the temperature is not closely controlled.

The American Temperature Regulator keeps the water temperature within set bounds preventing wastage from too-hot water or steam and avoiding annoyance from too-cool hot water.

These are safe yet sensitive instruments requiring the minimum of attention. Write to us for descriptive circular and information.

MAXWELL MANNING M&M MOORE INC. TRADE MARK

AMERICAN *Regulators*

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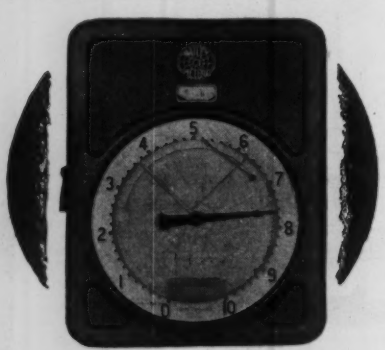

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Electrimatic Corp.
Electro-Medical Lab.
Emerson Apparatus Co.
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Foxboro Co.
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H-B Inst. Co., Inc.
Ill. Testing Labs.
Kessler Co.
Klipfel Mfg.
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Manning, Maxwell&Moore
Marsh Corp.
Mason-Neilan Co.
McAlear Mfg. Co.
Minneapolis-Honeywell
Moeller Instrument Co.
Moisture Register Co.
Moore Products
Paragon Electric Co.
Parks-Cramer Co.
Partlow Corp.
Precision Therm.
Republic Flow Meters
Revere Corp.
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Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Thwing-Albert Inst. Co.
Trerice Co.
United Elec. Controls
Watts Regulator Co.
Weksler Thermometer
Wheelco Inst. Co.

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Accuracy Scientific Inst.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
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Brown Inst. Co.
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Ermstat Co.
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Frież & Sons
Foster Eng. Co.
Fulton Syphon Co.
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Johnson Service Co.
Kiely & Mueller
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Marsh Corp.
Mercoid Corp.
Minneapolis-Honeywell
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Partlow Corp.
Penn Electric Switch
Perfex Corp.
Phila. Thermometer Co.
Powers Regulator Co.
Precision Therm.
Ranco Inc.
Rascher & Betzold
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Robertshaw Thermostat
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Ruggles-Klingemann
Samsel Time Control
Sarco Co., Inc.
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Struthers-Dunn
Taco Engineering
Tagliabue Div.
Taylor Inst. Co.
Time Co.
Trerice Co.
United Elec. Controls
Vaugnn-G. E. Witt Co.
Weston Elec. Inst. Corp.
White Mfg. Co.
White-Rodgers Elec. Co.

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Am. Gas Accumulator
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Automatic Elec. Mfg. Co.
Automatic Temp. Control
Bacon Elec. Timer
Bailey Meter Co.
Barber-Colman
Betts & Betts
Bristol Co.
Brown Inst. Co.
Cincinnati Time Rec.
Clare & Co.
Controls, Inc.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eagle Signal Corp.
Edison Electrical Prods.
Elec. Switch Corp.
Electronic Engineers
Fisher Governor
Foxboro Co.
Fredericks Co., Geo.
Frież & Sons, Julien
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Gorham Inst. Co.
Guardian Electric Mfg.
Hagan Corp.
Haydon Co.
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Johnson Service Co.
Leeds & Northrup
Luers, J. Milton
Lumenite Co.
Manning, Maxwell&Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Monitor Controller Co.
National Time & Signal
Northwestern Clock Co.
Paragon Electric Co.
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Photoswitch, Inc.
Photovolt Corp.
Powers Regulator Co.
Production Instrument
Rhodes, Inc., M. H.
Samsel Time Control
Sangamo Elec. Co.
Seely Inst. Co., Inc.
Standard Elec. Time
Stromberg Time Corp.
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Tagliabue Div.
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Thomas Clock Co., Seth
Thordarson Elec. Mfg.
Tork Clock Co.
United Cinephone Corp.
Wadsworth Elec. Mfg.
Walser Automatic Timer
Ward Leonard
Warren Telechron
Wheelco Insts. Co.
White Rodgers Elec.
Zenith Electric Co.

CONTROLLERS, AUTOMATIC, Vacuum (See Controllers, Automatic, Pressure)

CONTROLLERS, AUTOMATIC, Valve (See Valve-Operating Devices)

CONTROLLERS, AUTOMATIC, Viscosity

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Brookfield Engg. Labs.
Fischer & Porter
General Controls
General Elec. Co.
Perfex Corp.
Scientific Inst. Co.
Taco Engineering
Taylor Inst. Co.
United Cinephone Corp.

CONTROLLERS, AUTOMATIC, Voltage (See Regulators)

CONTROLLERS, AUTOMATIC, Volume (See Controllers, Automatic, Flow)

CONTROLLERS, AUTOMATIC, Water Level see Controllers, Automatic, Liquid Level

CONTROLLERS, MANUAL (Non-automatic), Field

Allis-Chalmers
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Cutler-Hammer, Inc.
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General Elec. Co.
Monitor Controller Co.
National Elec. Controller
Ohmite Mfg. Co.
Schaefer Bros. Co.
Taco Engineering
Ward Leonard Elec. Co.
Westinghouse Elec.

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Cash Co.
General Controls
Hagan Corp.
Hydraulic Controls
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.

CONTROLLERS, MANUAL (Non-automatic) Motor

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Automatic Elec. Mfg.
Cutler-Hammer, Inc.
Furnas Electric Co.
General Controls
General Elec. Co.
Monitor Controller Co.
National Elec. Controller
Ohmite Mfg. Co.
Schaefer Bros. Co.
Superior Electric Co.
Taco Engineering
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.

CONTROLLERS, MANUAL (Non-automatic) Rheostatic

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Beck Bros.
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General Controls
General Elec. Co.
Mallory & Co.
Monitor Controller Co.
National Elec. Controller
Ohmite Mfg. Co.
Rubicon Co.
Schaefer Bros. Co.
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CONTROL SYSTEMS (See Controllers, Automatic)

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Cook Electric
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Flett Laboratory
Rowe Radio Research
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COUNTERS, Colony

American Optical
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Berkeley Scientific
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North Amer. Philips
Stoelting Co., C. H.
Taco Engineering
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Victoreen Instrument Co.
Welch Mfg. Co.

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General Elec. Co.
Ohmer Register Co.
Paragon Electric Co.
Rowe Radio Research
Southwestern Electronics
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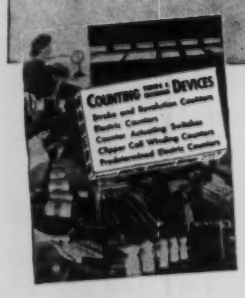

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DEMAND, Recorders (See Meters, Demand)

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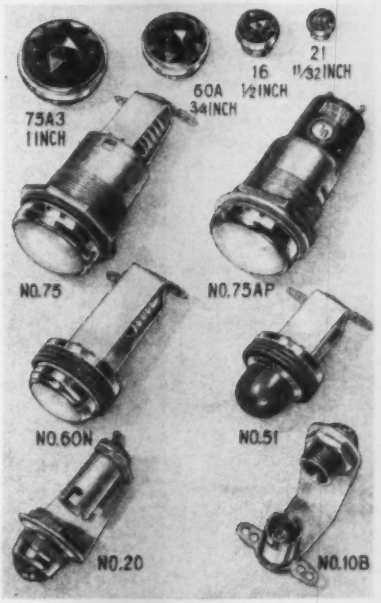

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Thwing-Albert Inst. Co.
Ward Leonard Elec. Co.

DIVIDERS, Voltage (Radio Frequency)
Andrew, Victor J.
Beck Bros.
Clarke Inst. Corp.
Ferris Inst. Corp.
General Elec. Co.
General Radio Co.
Instrument Resistors, Inc.
International Resistance
Mallory & Co.
Measurements Corp.
Muter Company
Ohmite Mfg. Co.
RCA Manufacturing
Sensitive Research Inst.
Shaileross Mfg. Co.
Sherron Metallic
Televiso Co.
Ward Leonard Elec. Co.

DIVIDING HEAD, OPTICAL
Ferner Co.
Gaertner Scientific
Jarrell-Ash Co.
Vinco Corp.
Zeiss, Inc., Carl

DIVIDING MACHINES
Brown & Sharpe
Ferner Co.
Gaertner Scientific Corp.
Hayes Scientific Apps.
Mico Instrument Co.
Precise Instrument Co.
Taco Engineering

DRAFT Indicators (See Gages, Draft) **Recorders** (See Gages, Draft)

DRAFT Controllers (See Controllers, Automatic Draft)

DRAWING INSTRUMENTS
Alpha Instrument Co.
Altender & Sons
Bruning Co., Inc.
Dietzgen Co.
Drafto Co.
Gurley, W. & L. E.
Henschel & Co.
Kern Co.
Keuffel & Esser Co.
Millers Falls Co.
Nelson Section Liner
Post Co., Frederick
Soltmann, Inc., E. G.
Speidel & Co.
Starrett Co., L. S.
Suverkrop Instruments
Trubene Mfg. Co.
Union Tool Co.
United States Blue Print
V. & E. Mfg. Co.
Warren-Knight Co.
Weber Co., F.
White Co., Inc., David

DRIFT INDICATORS
Driftmeters, Inc.
Eclipse-Pioneer Div.
Gurley, W. & L. E.
Kollmorgen Optical Co.
Kollsman Inst. Co.
Pioneer Instrument Co.
RCA Manufacturing
Maxwell Smith Co.
Thwing-Albert Inst. Co.

DRIFT INDICATORS, Bore Hole
Geophysical Inst. Co.
Ruska & Co.
Sperry-Sun Well Surveying

DUROMETERS (See Testers & Testing Machines, Hardness)

DUST ANALYSIS APPARATUS
Bausch & Lomb Optical
Central Scientific Co.
Corning Glass Works
Elmer & Amend
Falstrom Co.
Federal Pneumatic Systems
Fisher Scientific Co.
Mine Safety Appliances
Pfaltz & Bauer, Inc.
Sargent & Co.
Scientific Glass Apparatus
Scientific Inst. Co.
Willson Products, Inc.
Zeiss, Inc., Carl

DYNAMOMETERS, Hydraulic
Baldwin Southwark
Cole Instrument
Taylor Mfg. Corp.

DYNAMOMETERS, Pull Rod
Baldwin Southwark
Dillon & Co.
Hathaway Inst. Co.
Hayes Scientific Apps.
Martin Decker Corp.
Metron Instrument
Seederer-Kohlbusch, Inc.
Statham Labs.
Stoelting Co., C. H.

DYNAMOMETERS, Rotary Absorption
Bristol Co.
Cole Instrument
General Elec. Co.
L. A. B. Corp.
Mid-West Dynamometer

DYNAMOMETERS, Hydraulic
Cole Instrument
Taylor Manufacturing

DYNAMOMETERS, Tension
Baldwin-Southwark Corp.
Boulin Instrument Corp.
Chatillon & Sons
Dillon & Co.
Hathaway Inst. Co.
Metron Instrument
Olsen Testing Machine
Riehle Div.
Seederer-Kohlbusch
Statham Labs.
Stoelting Co., C. H.
Taco Engineering
Thwing-Albert
Waugh Labs.

DYNAMOMETERS, Transmission
Baldwin Southwark
Hathaway Instrument
Kellogg Switchboard
Rubicon Co.
Seederer-Kohlbusch

EARTH CURRENT METERS (See Meters, Earth Current)

EARTH RESISTANCE METERS
American Inst. Co.
Amer. Automatic Elec.
Associated Research
Biddle Co., Jas. G.
Geophysical Inst. Co.
Holland Research
Industrial Insts. Inc.
Rawson Electrical Inst.
Rubicon Co.
Shaileross Mfg.
Sticht & Co.

EBULLIOMETERS
American Inst. Co.
Braun Corp.
Central Scientific Co.
Elmer & Amend
Fisher Scientific
Precision Therm.
Rascher & Betsold
Tagliabue Div.

EBULLISCOPE (See Ebulliometers)

ECHELON GRATING (See Grating, Echelon)

ELECTRIC WAVE FILTER SECTIONS
American Radio Co.
Andrew, Victor J.
Bliley Electric Co.
Clarke Inst. Corp.
Clough-Brengle Co.
Freed Transformer
General Radio Co.
Millen Mfg. Co.
Sherron Metallic
Thordarson Elec. Mfg.
United Transformer Corp.

ELECTROANALYSIS APPARATUS
Burrell Tech. Sup.
Central Scientific
Cole Instrument
Coleman Electric
Eberbach & Son
Emby Products
Fisher Scientific
Leitz, Inc.
Precision Scientific
Schaar & Co.
Sherron Metallic

ELECTROMETERS, Quadrant
Cambridge Inst. Co.
Central Scientific Co.
Pfaltz & Bauer, Inc.
Rubicon Co.
Testrite Instrument Co.
Welch Mfg. Co.

ELECTROMETERS, String
Cambridge Inst. Co.
Dearborn Scientific
Geophysical Inst. Co.
Pfaltz & Bauer, Inc.
Taco Engineering
Victoreen Instrument Co.

ELECTRONIC METERS (See Meters, Electronic)

ELECTROPLATING SOLUTION TESTING APPARATUS
Central Scientific Co.
Federal Telegraph Co.
Fisher Scientific Co.
Hellige, Inc.
Industrial Insts. Inc.
Pfaltz & Bauer, Inc.
Sargent & Co.
Sherron Metallic
Taylor & Co., W. A.
Thwing-Albert Inst. Co.

ELECTROSCOPES
Chicago Apparatus Co.
Denver Fire Clay Co.
Geophysical Inst. Co.
Henson Co., Fred C.
Pfaltz & Bauer, Inc.
Taco Engineering

ELLIPSOGRAPHS (See Drawing Instruments)

END MEASURES
Acme Industrial
Ferner Co.
Pratt & Whitney

ENGINE INDICATORS (See Indicators, Engine)

ENGINE INDICATOR REDUCING MOTION (See Reducing Motion, Engine Indicator)

EUDIOMETERS
Ace Glass Inc.
Central Scientific Co.
Elmer & Amend
Machlett & Son

EUSCOPES
Bausch & Lomb Optical
Buehler, Adolph T.

EXPANSION TEST APPARATUS (See Testers, Expansion)

EXTENSOMETERS
American Inst. Co.
Baldwin-Southwark Corp.
Brabender Corp.
Cambridge Inst. Co.
Eitzen Co.
Federal Products Corp.
Ferner Co.
Gaertner Scientific
Gen. Engg. & Model Wks.
Hayes Scientific Apps.
Metzger & Son
Olsen Testing Machine
Statham Labs.
Swedish Gage

EYEGLASSES, POLARIZED (for Photoelastic Work or Strain Observation, etc.)
Polarizing Inst. Co.
Zeiss, Inc., Carl

FADE-OMETER
Atlas Elec. Devices Co.
Gen. Elec. Vapor Lamp

FAULT LOCATORS
Amer. Automatic Elec.
Industrial Insts. Inc.
Leeds & Northrup
Rawson Elec. Inst. Co.
Rubicon Co.
Shaileross Mfg. Co.
Tobe Deutschmann Corp.
Westinghouse Elec.

FEED WATER METERS
Bailey Meter Co.
Brown Inst. Co.
Builders-Providence
Central Station Steam
Cochrane Corp.
Elec. Indicator Co.
Fischer & Porter
Foxboro Co.
Hennsey Co.
Leeds & Northrup
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Rimplex Valve & Meter
Tagliabue Div.

FEED WATER TESTING APPARATUS
Allis-Chalmers
Burrell Technical Supply
Central Scientific Co.
Cochrane Corp.
Electronic Products Co.
G. M. Mfg. Co., Inc.
Hellige, Inc.
Industrial Insts. Inc.
LaMotte Chemical Prod.
Leeds & Northrup Co.
Paio-Myers
Pfaltz & Bauer, Inc.
Photovolt Corp.
Taylor & Co., W. A.

FEEDERS, Automatic, Proportioning
Automatic Temp. Control
Bowser & Co., S. F.
Builders-Providence
Everson Mfg. Co.
General Controls
Graver Tank & Mfg.
Henszey Co.
Infico Co.
McDonnell & Miller
Merrick Scale
Omega Machine
Permutit Co.
Proportioneers, Inc.
Wallace & Tiernan
Watts Regulator Co.

FEEDERS, Automatic, Granular Material
Builders-Providence
Infico Co.
Merrick Scale
Omega Machine
Permutit Co.
Proportioneers, Inc.
Stephens-Adamson
Wallace & Tiernan

FIELD RHEOSTATS (See Rheostats, Field)

FIELD-STRENGTH MEASURING SETS
Andrew, Victor J.
Clarke Inst. Corp.
Cole Instrument
Federal Telegraph Co.
Ferris Inst. Corp.
General Elec. Co.
Harvey Radio Labs.
McFarlin Co.
Measurements Corp.
Panoramic Radio Co.
RCA Manufacturing Co.
Tobe Deutschmann Corp.
Waugh Labs.

FILLING MACHINES, Automatic
All Amer. Tool & Mfg.
Anderson Bros. Mfg. Co.
Bowser & Co.
Gump Co., B. F.
Proportioneers, Inc.
Richardson Scale Co.
Taco Engineering
Triangle Package Mach.

FILLING MACHINES, Bag
Allis-Chalmers
Gump Co., B. F.
Richardson Scale Co.
Taco Engineering
Triangle Package Mach.

FILLING MACHINES, Barrel
Allis-Chalmers
Bowser & Co.
Taco Engineering

FILLING MACHINES, Can
Anderson Bros. Mfg.
Bowser & Co.
Gump Co., B. F.
Proportioneers, Inc.
Taco Engineering
Triangle Package Mach.

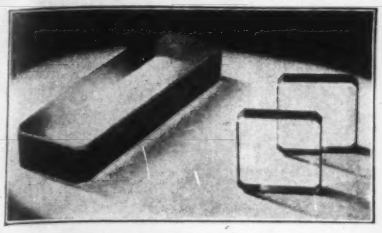
FILLING MACHINES, Carton
Gump Co., B. F.
Taco Engineering
Triangle Package Mach.

FILTERS, Light (See also Filters, Optical)
American Inst. Co.
Baird Associates
Bausch & Lomb Opt.
Central Scientific Co.
Corning Glass Works
Crystal Research Labs.
Dearborn Scientific
Fish-Schurman Co.
Fuess, Inc.
Goerz Amer. Optical Co.
Kollmorgen Optical Co.
Leitz, Inc.
Mogey & Sons
Perkin-Elmer Corp.
Maxwell Smith Co.
Zeiss, Inc., Carl

FILTERS, Optical
Akatos, Inc.
Baird Associates
Bausch & Lomb Optical
Binswanger & Co.
Bray Optical Co.
Cadillac Glass Co.
Crystal Research Labs.
Dearborn Scientific
Electronic Laboratory
Fecker, J. W.
Fish-Schurman
General Scientific Corp.
Geophysical Inst. Co.
Goerz Amer. Optical Co.
Hayward Optical Glass
Henson Co., Fred C.
Klett Mfg. Co.
Maxwell Smith Co.
Mico Instrument Co.
Mogey & Sons
Perkin-Elmer Corp.
Pfaltz & Bauer, Inc.
Photovolt Corp.
Pyrometer Inst. Co.
Rubicon Co.
Testrite Instrument Co.
Triumph Mfg. Co.
Unerti Optical Co.
United Cinephone Corp.
Univis Lens Co.

FINDERS, VALVE BOX
Geophysical Inst. Co.
Wilder, R. S.

FIRE CONTROL INSTRUMENTS, MILITARY & NAVAL
Bausch & Lomb
Bell & Howell Co.
Elec. Indicator Co.
Fecker, J. W.
General Elec. Co.
Kern Co.
Kollmorgen Optical Co.
Maxwell Smith Co.
Perkin Elmer Corp.
Robinette Co., W. C.
Sperry Gyroscope Co.
Unerti Opt. Co.
United Cinephone Corp.



OPTICAL FLATS: flat to 1/8 millionth of an inch per inch. Individually calibrated. Can be furnished with a reference scale etched on the surface to simplify measurements. Square shaped flats up to 6" × 6". Bars up to 10" long by 2⅜" wide. Special shapes and sizes, including round flats with holes.

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(See Testers, Flash Point)

FLASHERS, Neon Tube
Automatic Elec. Mfg. Co.
Bacharach Industrial Inst.
Betts & Betts
Paragon Electric Co.
Sangamo Electric Co.

FLATNESS TESTERS
(See Testers, Flatness, Light Wave)

FLATS, OPTICAL
Acme Industrial
American Optical
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Binswanger & Co.
Buehler, Adolph I.
Clark & Sons
Crystal Research Labs.
Dearborn Scientific Co.
Edmal Co.
English, R. E.
Fecker, J. W.
Ferner Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
General Scientific Corp.
Geophysical Inst. Co.
Glendale Optical
Goerz Amer. Optical Co.
Henson Co., Fred C.
Jarrell-Ash Co.
Kollmorgen Optical Co.
Master Optical Co.
Mico Instrument Co.
Miller Corp., William
Mogey & Sons
Optron Laboratory
Perkin-Elmer Corp.
Plummer & Kershaw
Robinson Optical
Ruska & Co.
Scherr Co., Inc., George
Simpson Optical
Swain Nelson Co.
Tinsley Laboratories
Unertl Optical Co.
Univis Lens Co.
Van Keuren Co.
Vard Inc.
Wilder, R. S.
Woermann-Schuchhardt
Zeiss, Inc., Carl

FLATS, OPTICAL, Fused Quartz
Acme Industrial
Bausch & Lomb Opt.
Buehler, Adolph I.
Crystal Research Labs.
Dearborn Scientific
Fish-Schurman Corp.
Gaertner Scientific
Geophysical Inst. Co.
Henson Co., Fred C.
Jarrell-Ash Co.
Mogey & Sons
Optron Laboratory
Perkin-Elmer Corp.
Plummer & Kershaw
Scherr Co., Inc.
Thermal Syndicate Ltd.
Tinsley Laboratories
Unertl Optical Co.

FLIGHT TEST INSTRUMENTS
Federal Telegraph Co.
Gannon Co.
General Elec. Co.
Globe Industries
Hathaway Instrument
Heiland Research
Impact Register
M. B. Mfg. Co.
Revere Corp.
Sperry Gyroscope Co.
Statham Labs.
Televiso Products
Waugh Labs.

"FLOW"

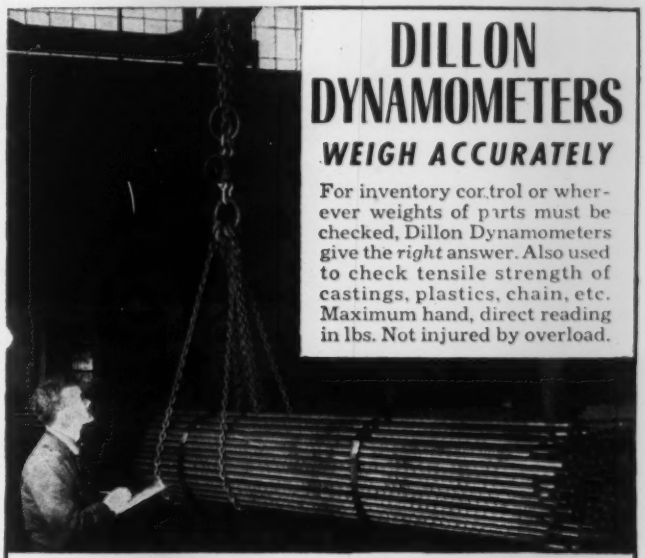
(Flowmeters measure primarily RATE of flow. For positive or "quantity" fluid meters, see the numerous classes under "Meters")

FLOWMETERS, AIR
(See Flowmeters, Gas)

FLOWMETERS, AREA
Cone & Disk Type
Cochrane Corp.
Commercial Research
Fischer & Porter
Frica & Sons
Hays Corp.
National Meter Co.

FLOWMETERS, AREA
Cylinder & Piston Type
American Inst. Co.
Bowser & Co.
Brown Inst. Co.
Fischer & Porter
National Meter Co.
New Jersey Meter Co.

FLOWMETERS, AREA
Free Float Type
Am. Gas Furnace Co.
Commercial Research
D'Este Division
Fischer & Porter
Fish-Schurman Corp.
Hoke, Inc.
Schutte & Koerting Co.



DILLON DYNAMOMETERS

WEIGH ACCURATELY

For inventory control or wherever weights of parts must be checked, Dillon Dynamometers give the *right* answer. Also used to check tensile strength of castings, plastics, chain, etc. Maximum hand, direct reading in lbs. Not injured by overload.

ACCURATE—COMPACT

Weigh only 8 lbs. 4 oz., measure 8¼"x6¼"x3". Capacities from 500 up to 20,000 lbs. Equipped with shackles. May be used with turnbuckles, overhead crane, block and tackle, etc. Thousands in daily use. Low cost—immediate delivery.

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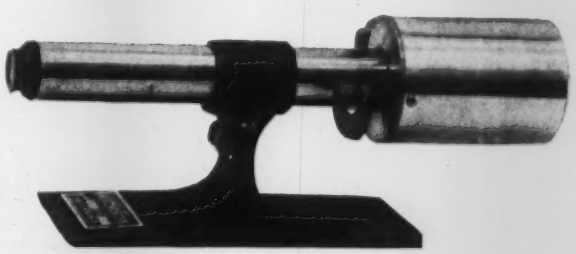
FLOW METERS

● The Type H illustrated is an extremely accurate indicating instrument for measuring the flows of gases or liquids when operating pressures do not exceed 250 lbs. per sq. in. and the differential pressure does not exceed 160 inches of water pressure. Wall or Panel Mounting. Direct reading scales to meet any requirement. Also Inclined Tube types—for low differential ranges of 25" or 49" of water. Fully descriptive catalog sent on request.

THE MERIAM INSTRUMENT CO.
10938 MADISON AVENUE
CLEVELAND 2, OHIO

Manometers, Meters, and Gauges for the accurate measurement of Pressures, Vacuums and Flows of Liquids and Gases.

THE QUARTZ FIBRE ELECTROSCOPE



MODEL "1"

FRED C. HENSON CO.

Specializing in

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3311 E. COLORADO ST.
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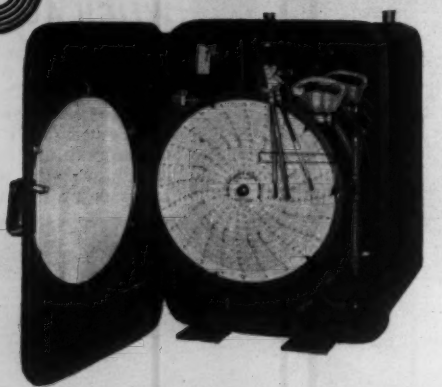
FLOW METERS



● **Ring-Balance Flow Meters for Low and High Pressures.** For metering of all fluids and gasses are available in a complete line to meet every flow problem. Recording — indicating — integrating. Graphic temperature and pressure recording, or both. Single meters or dual meters recording on same chart. Wide range flexibility from ½ inch to 150 inches maximum, water differentials for standard meters —up to 450 inches differentials on multiple ring meters at a slight extra cost. Static pressures up to 700 p.s.i.

RING BALANCE
Ring Balance INSTRUMENT CO.
MECHANICAL FLOW METERS · PRESSURE & VACUUM RECORDERS
760 NORTH FRANKLIN STREET · CHICAGO 10, ILLINOIS

FLOWMETERS, AREA Orifice & Plug Type
American Meter Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Brown Inst. Co.
Cochrane Corp.
Fischer & Porter
Hays Corp.
Henszey Co.
Mason-Neilan Regulator
Meriam Inst. Co.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.
Trimount Instrument

FLOWMETERS, BLAST (See Flowmeters, Gas)

FLOWMETERS, GAS
Ace Glass, Inc.
American Dist. Steam
American Gas Furnace
American Inst. Co.
American Meter Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
(Cont'd)

FLOWMETERS, GAS (Cont'd)
Bowser & Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Clark Blast Meter
Cochrane Corp.
Commercial Research
Cook Electric
Corning Glass Works
D'Este Co.
Detroit Air Meter Co.
Eclipse-Pioneer Div.
Elec. Indicator Corp.
Fischer & Porter
Fish-Schurman Co.
Foxboro Co.
Friez & Sons
Gas Appliance Specialties
General Elec. Co.
Hays Corp.
Henszey Co.
Hoke, Inc.
Ill. Testing Labs.
International Filter Co.
Kollsman Inst. Co.
Lambert Meter Co.
Leeds & Northrup
(Cont'd)

FLOWMETERS, GAS (Cont'd)
Leupold, Volpel & Co.
Linde Air Products
Mason-Neilan Regulator
Meriam Co.
Moore Products
Morey & Jones, Ltd.
National Meter Co.
New Jersey Meter Co.
Pitometer Log Corp.
Precision Scientific
Republic Flow Meters
Revere Corp.
Ring Balance Co.
Schutte & Koerting Co.
Scientific Glass Apparatus
Selas Company
Simplex Valve & Meter
Statham Labs.
Superior Meter Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trimount Instrument
Victor Equipment Co.

FLOWMETERS, LIQUID (See Flowmeters, Gas)

FLOWMETERS, Open-Stream
Bailey Meter Co.
Bristol Co.
Builders-Providence
Cochrane Corp.
Foxboro Co.
Hays Corp.
Leupold & Stevens
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Ring Balance Inst.
Scientific Inst. Co. Calif.
Simplex Valve & Meter
White Co.

FLOWMETERS, Orifice, and Nozzle
Ace Glass Inc.
American Dist. Steam
American Meter Co.
Askania Regulator Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Cochrane Corp.
Commercial Iron Works
Corning Glass Works
Elmer & Amend
Fischer & Porter
Foxboro Co.
Hays Corp.
Hoke, Inc.
Lambert Meter Co., Inc.
Leeds & Northrup Co.
Leupold & Stevens
Mason-Neilan Regulator
Meriam Co.
(Cont'd)

FLOWMETERS, Orifice & Nozzle (Cont'd)
Moore Products
Morey & Jones, Ltd.
Permutit Co.
Pgh. Equitable Meter
Republic Flow Meters
Ring Balance Co.
Robinson Orifice
Schutte & Koerting
Scientific Glass Apparatus
Scientific Inst. Co.
Simplex Valve & Meter
Tagliabue Div.
Taylor Inst. Cos.
Trimount Instrument

FLOWMETERS, Pitot Tube
Am. Blower Corp.
American Meter Co.
Askania Regulator Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Cambridge Inst. Co.
Central Scientific Co.
Cochrane Corp.
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Ellison Draft Gage Co.
Foxboro Co.
Friez & Sons
Fuess, Inc.
Hays Corp.
Kollsman Inst. Co.
Leupold & Stevens
Meriam Co.
Morey & Jones, Ltd.
Pitometer Log Corp.
Precision Therm. & Inst.
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Ring Balance Co.
Simplex Valve & Meter
Taco Engineering
Taylor Inst. Cos.
Trimount Instrument

FLOWMETERS, Steam
Am. Dist. Steam Co.
American Meter Co.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Cochrane Corp.
Fischer & Porter
Foxboro Co.
Hays Corp.
Leeds & Northrup Co.
Mason-Neilan Regulator
Meriam Co.
Moore Products
Morey & Jones, Ltd.
Republic Flow Meters
Ring Balance Co.
Simplex Valve & Meter
Tagliabue Div.
Taylor Inst. Cos.
Trimount Inst.

FLOWMETERS, Vane
Autocall Co.
Detroit Air Meter Co.
Friez & Sons
Hays Corp.
Ill. Testing Labs.
Mason-Neilan Regulator
Ring Balance Inst.
Simplex Valve & Meter

FLOWMETERS, Venturi Type
American Meter Co.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Cochrane Corp.
Foxboro Co.
Gauthier, Donat A.
Hays Corp.
Infilco, Inc.
International Filter Co.
Leeds & Northrup
Leupold & Stevens
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Ring Balance Co.
Simplex Valve & Meter
Taylor Inst. Cos.

FLOWMETERS, Weir
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Cochrane Corp.
Elec. Indicator Corp.
Fischer & Porter
Foxboro Co.
Gurley, W. & L. E.
Hays Corp.
Leupold & Stevens
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.

FLUE GAS ANALYZERS (See Gas Analyzers, Flue Gas)

FLUID METERS, GAS (See Gas Meters)

FLUID METERS, LIQUID (See Meters, Liquid)

ORIFICE METERS
Recording and Integrating

Give totalized readings of quantity which has passed through orifice for all flow rates and pressure variations. Integrating for static pressure as well as for differential.

Send for Catalog EG-2 giving complete specifications.

2178

AMERICAN METER COMPANY
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Sylphon-Actuated
ORIFICE METER

Spring-loaded bellows replaces the usual mercury monometer. Designed for measurement of liquids where it is not advisable to use mercury.

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60 EAST 42nd STREET, NEW YORK 17, N. Y.

FLUID METERS, QUANTITY (See Gas Meters; Meters, Current; Meters, Liquid)

FLUORESCENT CHEMICALS
Central Scientific Co.
Fisher Scientific
Laboratory Specialties
Pfaltz & Bauer, Inc.
Patterson Screen Div.
U. S. Radium Corp.

FLUORESCENCE
Ultra-Violet Products
Patterson Screen Div.

FLUORESCENT PAINT APPLIED
Canadian Radium
Central Scientific
General Luminescent
Lustrolite Cleveland
U. S. Radium Corp.

FLUORESCENT MERCURY VAPOR TUBES EMITTING WHITE LIGHT (See Light Sources)

FLUOROSCOPES
General Electric X-Ray
Kelley-Koett
Patterson Screen Div.
Westinghouse X-Ray Co.
Westinghouse Elec.

FLUXMETERS
Annis Co.
Cambridge Inst. Co.
Central Scientific Co.
Clarke Inst. Corp.
General Elec. Co.
Leeds & Northrup Co.
Marion Electrical Inst.
Rawson Electrical Inst.
Readrite Meter Wks.
Rubicon Co.
Sensitive Research Inst.
Taco Engineering

FOLDING ENDURANCE TESTERS (PAPER) (See Testers, Folding Endurance)

FOOT BLOCKS
Ford Motor Co.

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FORKS, Synchronization
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Elec. Tachometer Corp.
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FORKS, Tuning
American Time Prods.
Clay-Adams Co.
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Hathaway Instrument
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FLOWMETERS

With segmental or round type dial . . . used to indicate flow rate of air, gas, oil, steam or water.

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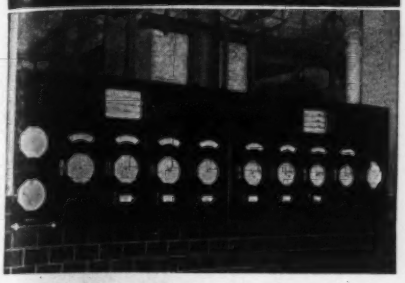
FLOW METERS



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Republic meters are available for all working pressures up to 5000 lb. per sq. in.

RANGE EASILY CHANGED

The range of a Republic meter can be easily and quickly changed by merely changing the range tube.

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The Republic indicator, recorder and integrator operate independently of each other and can be supplied separately or in combination. They are remote reading.

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Hathaway Inst. Co.
Leeds & Northrup
Metron Instrument
Riverbank Laboratories
Sherron Metallic
Stoelting Co., C. H.
Welch Mfg. Co.

FORKS, Vacuum Driven
Cambridge Inst. Co.
Gaertner Scientific Corp.
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FREENESS TESTERS (See Testers, Freeness)

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General Elec. Co.
Kellogg Switchboard
Leeds & Northrup Co.
Taco Engineering

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Clarke Inst. Corp.
Cole Instrument
Daven Co.
De Jur-Amsco Corp.
Electro Products Lab.
Garner Electronics
General Elec. Co.
General Radio Co.
Harvey Radio Labs.
Hastings Inst. Co.
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Knights Co.
Lampkin Lab.
Lavoie Laboratories
Metron Instrument
Millen Mfg. Co.
RCA Manufacturing Co.
Rowe Radio Research
Sherron Metallic
Taco Engineering

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Cole Instrument
Electro-Tech Equip.
Electronic Engineers
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General Radio Co.
Hagedorn Engineering
Hastings Inst. Corp.
Hathaway Instrument
(Cont'd)

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Metron Instrument
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RCA Manufacturing Co.
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Metron Instrument
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Sound Apparatus
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Crystal Research Labs.
Doolittle Radio
Ferris Inst. Corp.
Garner Electronics
General Radio Co.
Hathaway Instrument
Millen Mfg. Co.
RCA Manufacturing Co.
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Biddle Co., Jas. G.
Cole Instrument
Hagedorn Engineering
J-B-T Insts., Inc.
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Lewyt Metal Prod.
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Southern Desk Co.
Welch Scientific

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Kellogg Switchboard
Littelfuse, Inc.
Meter Devices Co.
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DoAll Co.
Ford Motor Co.
Illinois Tool Works
Jansson Gage Co.
Lincoln Park Tool
Pratt & Whitney
Precision Scientific
Scherr Co., George
Standard Gage Co.
Swedish Gage
Van Keuren Co.
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GAGE BLOCKS, Angle
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GAGE BLOCKS, Surface Finish
Surface Checking Gage

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Amthor Testing Inst. Co.
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Crosby Steam Gage Co.
Gordon Co., Claud S.
Grove Regulator
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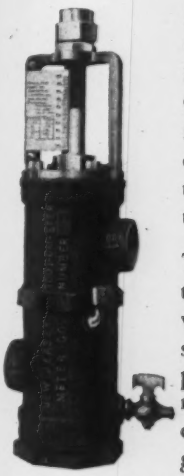

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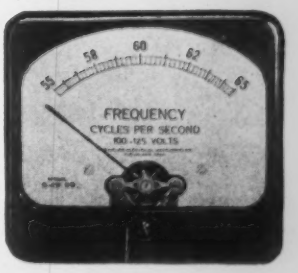

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Available in 4" rectangular panel mounting case—other sizes up to 6" case—entirely self-contained—*no external reactor* . . . Overall accuracy is better than .2 of a cycle in 60 cycles . . . Made with 55 to 65 cycle reading but also available in 59-61 cycle for greater reading accuracy and other ranges of frequency . . . Indication by pointer and graduated scale, easy to read . . . Vibration-proof and shock-proof . . . Damping can be adjusted to suit extreme conditions of frequency variation . . . Accurate within ambient temperature range from minus 10 to plus 40 degrees C . . . Power consumption only 0.8 watts at 115 volts.

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J-B-T

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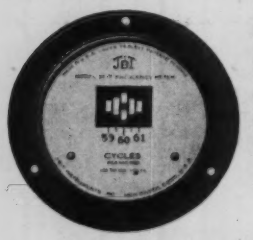
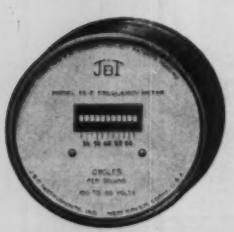
You can depend on J-B-T Instruments, where experience ranges from small laboratory lots to largest quantity orders over hundreds of applications. The line covers frequencies from 15 to 550 cy. (and up to 3600 cy. on vacuum tube—reed models) with various voltages, reed groupings and case sizes. Below are shown some typical variations.

Many leading electronic parts distributors stock standard J-B-T Models.



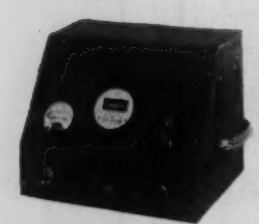
Model 31-F, 5 reed, half-cycle increment, in 3¼" metal case for flush panel mounting . . . indicating 60 cycles.

Model 30-FX, standard 3½" molded case, double window for ease of reading . . . shown indicating 60 cycles. Dual range is popular for export.



Model 53-F, 5", 9 reed for front of panel mounting.

Model 33-FP9, widely used 400 cycle portable in metal case.



Model 39-VTF, vacuum tube frequency meter for 400, 800, 1200, 1600, 2400, and 3600 cycle bands. Accuracy, ±0.25%. Often used to standardize less accurate frequency measuring units.

Bulletins available: VF-43, basic designs; VF-43-1A, 400 cy. meters; VF-43-1B, 2½" reed meters; VF-43-1C, interesting applications; VF-43-1D, vacuum tube frequency meters.

(Manufactured under Triplett Patents and/or Patents Pending)

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Ideal Lab. Tool
Manning, Maxwell & Moore
Meriam Inst. Co.
Pioneer Instrument
Refinery Supply
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Trerice Co.

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GAGES, Absolute Pressure
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Bristol Co.
Brown Inst. Co.
Clapp Instrument
Cook Electric
Electro Products Lab.
Foxboro Co.
Fulton Sylphon Co.
General Elec. Co.
Kollsman Inst. Div.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Inst. Co.
Moeller Instrument Co.
Pioneer Instrument
Precision Therm.
Scientific Inst. Co.
Statham Labs.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trimount Inst. Co.
Uehling Instrument Co.
United States Gauge Co.
Victor Equipment Co.
Wallace & Tiernan

GAGES, Adjustable Length
Acme Industrial
Barker Tool Die
Federal Products Corp.
Merz Engineering
Scherr Co., George
Size Control Co.
Standard Gage
Vinco Corp.
Woodworth Co.

GAGES, Air
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Bastian-Blessing Co.
Bristol Co.
Clapp Instrument
Cleveland Fuel Eng.
(Cont'd)

GAGES, Air (Cont'd)
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Eclipse-Pioneer Div.
Electric Auto-Lite
Foxboro Co.
Frisz & Sons
Fulton Sylphon Co.
Gauthier, Donat A.
Hays Corp.
Helicoid Gage Div.
Lambert Meter Co., Inc.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Inst. Co.
Merz Engineering
Rochester Mfg. Co.
Sheffield Corp.
Star Brass Mfg.
Statham Labs.
Taco Engineering
Tagliabue Div.
Trerice Co.
Uehling Inst. Co.
U. S. Gage Co.
Victor Equipment Co.

GAGES, Alarm
Ashton Valve Co.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown Inst. Co.
Ellison Draft Gage Co.
Foxboro Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Petrometer Corp.
Precision Therm. & Inst.
Star Brass Mfg.
Taco Engineering
Trerice Co.
U. S. Gage Co.
Wheelco Instruments

GAGES, Amplifying
Coats Mach. Tool Co.
Comtor Co.
Federal Prod. Corp.
Poole Manufacturing
Precision Gage & Tool
Saxl Instr. Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Swedish Gage
Taco Engineering
United Cinephone Corp.

GAGES, Automatic Sorting
Cole Instrument
Electric Sorting Machine
Federal Products Corp.
Hathaway Instrument
Heyman Co.
(Cont'd)

GAGES, Automatic Sorting (Cont'd)
Instrument Specialties Co.
Rowe Radio Research
Taco Engineering

GAGES, Bore
Barker Tool Die
Brown & Sharpe
Comtor Co.
Federal Prod. Corp.
Gauthier, Donat
Merz Engineering
Moore Products
Poole Manufacturing
Pratt & Whitney
Scherr Co.
Sheffield Corp.
Size Control Co.
Standard Gage
Swedish Gage

GAGES, Bourdon
Ashton Valve Co.
Bailey Meter Co.
Baldwin-Southwark Corp.
Bastian-Blessing Co.
Belfield Co.
Bristol Co.
Brown Inst. Co.
Crosby Steam Gage
Clapp Instrument
Dickson Co.
Electric Auto-Lite
Foxboro Co.
Gordon Co., Claud S.
Hays Corp.
Heise Bourdon Tube
Helicoid Gage Div.
Hoke, Inc.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Mercoid Corp.
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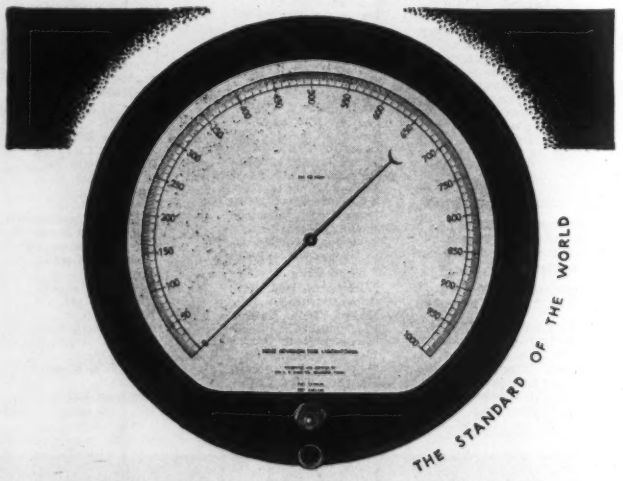
Republic Flow Meters
Star Brass Mfg. Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
United States Gauge Co.
Weksler Thermometer
Welch Scientific

GAGES, Caliper (Dial)
Amer. Measuring Insts.
Brown & Sharpe
Comtor Co.
DoAll Co.
Federal Prod. Corp.
Glogau & Co.
Marshall Co.
Size Control Co.
Starrett Co.
Vinco Corp.
Waltham Dial Gage



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IN COLLABORATION WITH THE A. H. EMERY COMPANY

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FREQUENCY STANDARD
(60 cycle) for use with external power supply

CENTER
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Records time intervals with resolution to .001 second

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(120 cycles) with self-contained power supply

These tuning forks which include new engineering principles, provide frequencies from 120 to 1,000 cycles directly with an unqualified guarantee of accuracy to 1 part in 100,000 over a wide temperature range. (Better than 1 second in 24 hours). Closer tolerances are obtainable on special order.

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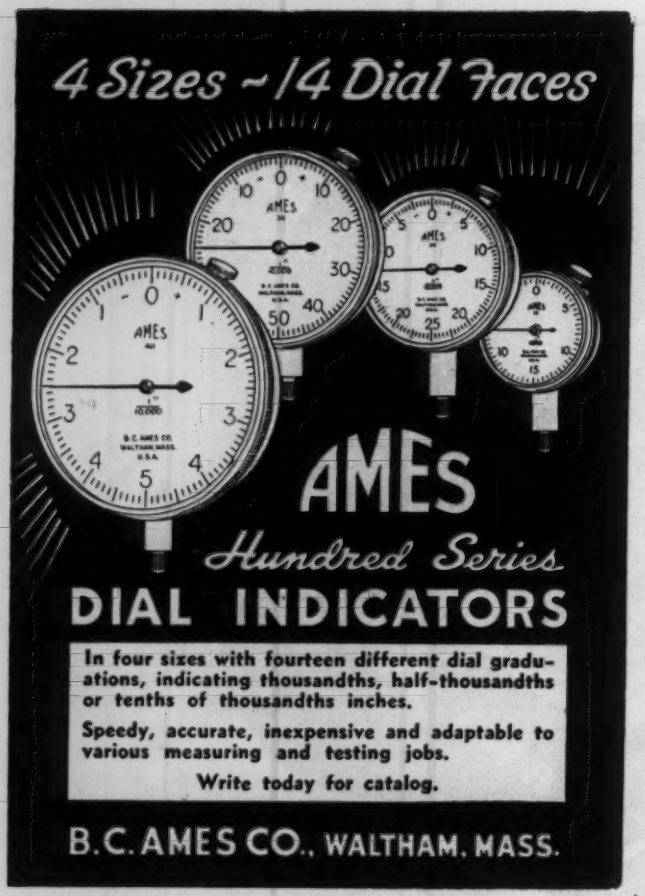
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Federal Prod. Corp.
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General Elec. Co.
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Instrument Specialties Co.
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Moore Products
Poole Manufacturing
Pratt & Whitney
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Saxl Inst. Co.
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Size Control Co.
Standard Gage
Surface Checking Gage
Swedish Gage
United Cinephone Corp.
Vard, Inc.
Vinco Corp.
Waltham Dial Gage
Woodworth Co.

GAGES, Compression
Bacharach Indus. Inst.
Baldwin Southwark
Dillon & Co.
G. M. Co. Mfg.
Marsh Corp.
Precision Scientific
Richie Div.
Saxl Inst. Co.
Taco Engineering
Toledo Scale Co.
United States Gauge Co.

GAGES, Continuous, Thickness
Barker Tool Die
Eitzen Co.
Federal Products Corp.
Foxboro Co.
Gauthier, Donat A.
Hathaway Instrument
Magnetic Gauge Co.
Master Gauge
Merz Engineering
Poole Manufacturing
Pratt & Whitney
Taco Engineering
Tejeviso Products
Saxl Instrument
Starrett Co.
Vinco Corp.
Waltham Dial Gage

GAGES, Continuous, Width
Barker Tool Die
Federal Products Corp.
Gauthier, Donat A.
Hathaway Instrument
Magnetic Gauge Co.
Merz Engineering
Taco Engineering
Vinco Corp.

GAGES, Contour see **Gages, Profile**

GAGES, Cylinder
Ames Co., B. C.
Coats Mach. Tool
Comtor Co.
Elgin National Watch
Federal Prod. Corp.
Lufkin Rule Co.
Master Gauge
Merz Engineering
Pratt & Whitney
Poole Manufacturing
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
Swedish Gage
Taco Engineering
United Cinephone
Victor Equipment

GAGES, Dead Weight
American Instrument
Eastern Specialty
Gordon Co., Claud S.
Grove Regulator
Manning, Maxwell & Moore
Mansfield & Green
Ruska Inst. Corp.
Star Brass

GAGES, Depth, Linear
Amer. Measuring Insts.
Ames Co., B. C.
Barker Tool Die
Brown & Sharpe
Carson Micrometer
DoAll Co.
Federal Products Corp.
General Elec. Co.
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Lufkin Rule Co.
Master Gauge
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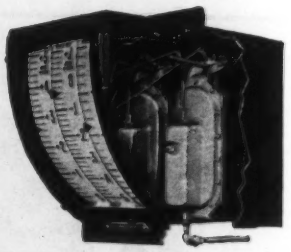

BAILEY MULTI-POINTER GAGES

● Bailey Multi-Pointer Gages are made with any number of pointers and any scale combination from one to twelve. The pointers have 10" motion over plainly marked plastic molded scales so that readings can be taken at a distance of 20 feet. Diaphragm actuated elements enable this gage to withstand over-drafts and over-pressures without injury to the unit or its calibration.

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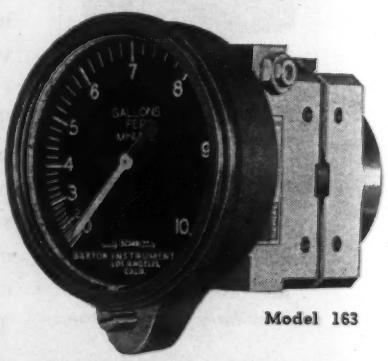
Bailey Meter Company Ltd., Montreal, Canada

Differential Pressure INDICATOR



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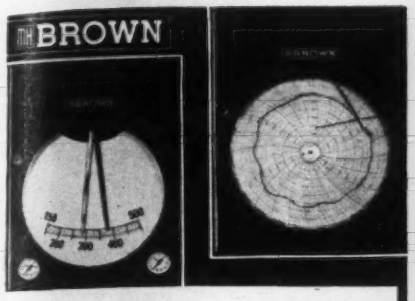

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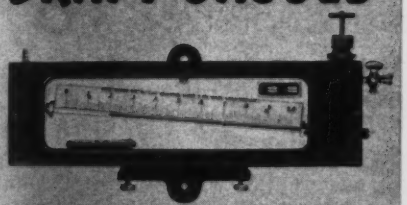
BROWN INSTRUMENTS
AND
MINNEAPOLIS HONEYWELL CONTROL SYSTEMS

DRAFT GAUGES



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Pratt & Whitney
R & M Mfg. Co.
Ryan Tool & Engg.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
Swedish Gage
Union Tool Co.
Vinco Corp.
Waltham Dial Gage

GAGES, Depth, Navigational
Geophysical Inst. Co.

GAGES, Dial, Machinists'
Ames Co., B. C.
Brown & Sharpe
Chicago Dial Ind.
DoAll Co.
Federal Prod. Corp.
Ferner Co.
Genaies, Andrew
General Engg & Model
Micro Master Co.
Randall, Frank E.
Size Control Co.
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Starrett Co.
Vinco Corp.
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GAGES, Differential Pressure
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Bailey Meter Co.
Barton Inst. Co.
Boiler Room Equip.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Cleveland Fuel Engr.
Crosby Steam Gage
Defender Automatic Reg.
Detroit Air Meter Co.
Dwyer Mfg. Co.
Ellison Draft Gage Co.
Electro Products Lab.
Foxboro Co.
Frisz & Sons
Fuess, Inc.
Gas Appliance Specialties
Gauthier, Donat A.
General Elec. Co.
Hays Corp.
Kollsman Inst. Div.
Lambert Meter Co.
Leupold & Stevens
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Co.
Metron Instrument
Moeller Instrument
Moore Products Co.
Morey & Jones, Ltd.
Perfex Corp.
Pioneer Instrument
Pitometer Log Corp.
Precision Scientific
Precision Therm.
Preferred Utilities Mfg.
Republic Flow Meters
Ring Balance Inst.
Scientific Glass Apparatus
Scientific Inst. Co.
Simplex Valve & Meter
Star Brass
Statham Labs.
Taco Engineering
Tagliabue Div.
Taylor Inst. Co.
Trimount Instrument
Uehling Instrument Co.
U. S. Gauge Co.

GAGES, Draft (See Gages, Differential Pressure)

GAGES, Drill Grinding
Lufkin Rule Co.
Morse Twist Drill
Size Control Co.
Starrett Co.

GAGES, Feeler
Acme Industrial
Barker Tool Die
Elgin National Watch
Improved Gauge Mfg.
Lufkin Rule Co.
Millers Falls Co.
Size Control Co.
Starrett Co.
Swedish Gage
Union Tool Co.
Van Keuren Co.
Vinco Corp.

GAGES, Flush Pin
Acme Industrial
Allen Gauge & Tool Co.
Amer. Measuring Insts.
Barker Tool Die
Elgin National Watch
Federal Products Corp.
Jansson Gage Co.
Lawrence & Hill
Lincoln Park Industries
Lufkin Rule Co.
Master Gauge
Merz Engineering
Size Control Co.
Swedish Gage
Vinco Corp.
Woodworth Co.

GAGES, Gas
Abercrombie Pump Co.
American Meter Co.
Bailey Meter Co.
Bastian-Blessing
Bristol Co.
Connelly Iron Sponge
Detroit Air Meter
Dickson Co.
Foxboro Co.
Gas Appliance Specialties
General Elec. Co.
Linde Air Products
Lambert Meter Co.
Meriam Co.
Mason-Neilan Regulator
Marsh Corp.
Republic Flow Meters
Rochester Mfg. Co.
Specialty Glass Co.
Statham Labs.
Superior Meter Co.
Tagliabue Div.
Taylor Inst. Cos.
Victor Equipment

GAGES, Grinding
Ames Co., B. C.
Barker Tool Die
Brown & Sharpe
Comtor Co.
Elgin National Watch
Federal Prod. Corp.
Lufkin Rule Co.
Master Gauge
Merz Engineering
Moore Products
Sheffield Corp.
Taco Engineering

GAGES, Grinding Finish
Surface Checking Gage

GAGES, Height
Allen Gauge & Tool Co.
Amer. Measuring Insts.
Ashton Valve Co.
Barker Tool Die
Brown & Sharpe
DoAll Co.
Federal Products Corp.
Ford Motor Co.
General Engg. & Model
Jansson Gage Co.
Lufkin Rule Co.
Master Gauge
Merz Engineering
Ryan Tool & Engg.
Scherr Co.
Sheffield Corp.
Standard Gage
Starrett Co.
Taco Engineering
Vinco Corp.

GAGES, Hook
Barker Tool Die
Gurley, W. & L. E.
Leupold & Stevens
Lufkin Rule Co.
Scientific Inst. (Calif.)
White Co. Inc.

GAGES, Hydrostatic (See Gages, Liquid Level, Indicating)

GAGES, Internal Dial
Coats Mach. Tool
Comtor Co.
DoAll Co.
Federal Prod. Corp.
Gen. Engg. & Model Wks.
Merz Engineering
Scherr Co.
Size Control Co.
Standard Gage
Swedish Gage
Vinco Corp.

GAGES, Limit
Acme Industrial
Amer. Measuring Insts.
Barker Tool Die
Detroit Tap & Tool
Ford Motor Co.
Fox Munitions
General Elec. Co.
Gen. Engg. & Model Wks.
Greenfield Tap & Die
Jansson Gage Co.
Master Gauge
Metron Instrument
Merz Engineering
M-C Gage Corp.
Pratt & Whitney
Sheffield Corp.
Size Control Co.
Standard Gage
Swedish Gage
Taco Engineering
United Cinephone
Van Keuren Co.
Vinco Corp.
West & Dodge
Woodworth Co.

GAGES, Liquid Level, Indicating
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Anderson Co.
Ashton Valve Co.
Autocall Co.
Automatic Temp. Control
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bastian-Blessing
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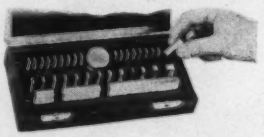

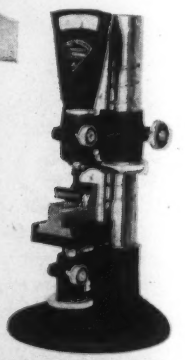

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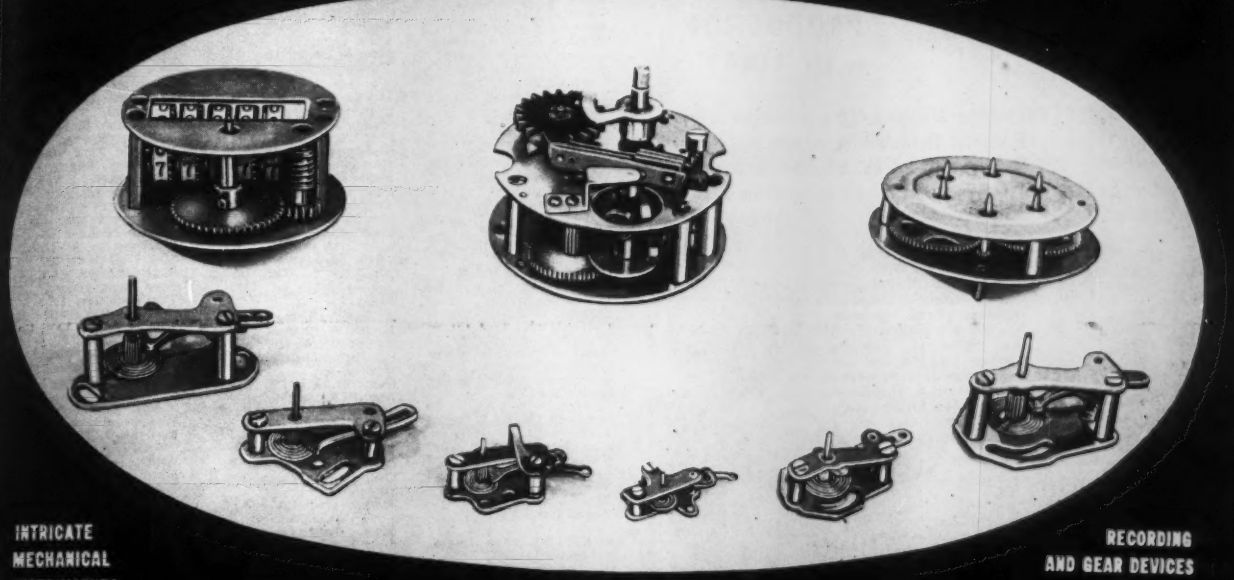

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Elec. Indicator Corp.
Elec. Tachometer Corp.
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Electronic Prod. Co.
Fisher Governor Co.
Foxboro Co.
Frick Co.
General Controls Co.
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Gorrell & Gorrell
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Hammel-Dahl Co.
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Hays Corp.
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Jerguson Gage Co.
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Kellogg Switchboard
King Engineering
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Leeds & Northrup Co.
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Liquidometer Co.
Liquid Scale-Gauge
Lufkin Rule Co.
Lumenite Elec. Co.
Manning, Maxwell & Moore
Mesh Corp.
Mason-Neilan Regulator
McAlear Mfg. Co.
McNeill Engr. Equip.
Meriam Co.
Moore Products
Morey & Jones, Ltd.
Nathan Mfg. Co.
Natural Gas Equipment
Paragon Electric
Penberthy Injector Co.
Petrometer Corp.
Pitometer Log Corp.
Pneumercator Co., Inc.
Positel Mfg. Co.
Precision Therm.
Preferred Utilities Mfg.
Reliance Gauge Column
Republic Flow Meters
Ring Balance Inst.

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GAGES, Liquid Level Indicating (Cont'd)

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Schutte & Koerting Co.
Simmonds Aerocessories
Simplex Valve & Meter
Smith Meter Co.
Statham Labs.
Star Brass Mfg.
Taco Engineering
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Taylor Inst. Cos.
Trerice Co.
Trimount Instrument
Uehling Instrument Co.
U. S. Gauge Co.
Vapor Recovery Systems
Wallace & Tiernan
Weksler Thermometer
Warrick Co.
Westinghouse Elec. & Mfg.
Wheelco Inst. Co.
Williams Gauge Co.
Wright-Austin Co.
Yarnall-Waring Co.

GAGES, Liquid Level, Recording (See Gages, Liquid Level, Indicating)

GAGES, Loss of Head

Bailey Meter Co.
Barton Inst Co.
Bristol Co.
Builders-Providence
Foxboro Co.
Infilco, Inc.
International Filter Co.
Morey & Jones, Ltd.
Republic Flow Meters
Star Brass
Taylor Inst. Cos.

GAGES, Mercury

Amthor Testing Mach.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Builders-Providence
Central Scientific
Connelly Iron Sponge
Defender Automatic Reg.
Distillation Products
Dubrovin, John
Dwyer Mfg. Co.
Elmer & Amend
Electronic Products
Gas Appliance Specialties
General Elec. Co.

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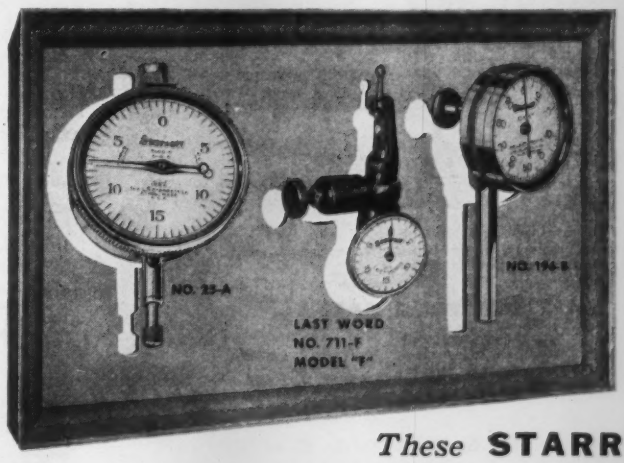

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Machlett & Son
Manning, Maxwell & Moore
Mason-Neilan Regulator
Meriam Co.
Moeller Instrument
Morey & Jones
Precision Therm.
Refinery Supply Co.
Scientific Glass Apparatus
Simplex Valve & Meter
Specialty Glass Co.
Stoelting Co., C. H.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Trimount Instrument
Uehling Instrument Co.
Wallace & Tiernan
Welch Scientific
Westinghouse Elec.

GAGES, Micrometer
American Meter Co.
Ames Co., B. C.
Amthor Testing Mach.
Axelson Mfg.
Brown & Sharpe
Central Scientific Co.
Coats Mach. Tool Co.
Elgin National Watch
Gaertner Scientific Corp.
Gauthier, Donat A.
Instrument Specialties Co.
Lufkin Rule Co.
Millers Falls Co.
Precision Therm. & Inst.
Scherr Co.
Size Control Co.
Slocomb Co.
Swedish Gage
Van Keuren Co.
Vinco Corp.
Zeiss, Inc., Carl

GAGES, Oil (See Gages, Liquid Level)

GAGES, Optical
Acme Industrial
Amer. Measuring Insts.
Bausch & Lomb
Chicago Dial Ind. Co.
Clark & Sons
DoAll Co.
Fecker, J. W.
Gaertner Scientific Corp.
Jarrell-Ash Co.
Jones & Lamson Machine
Perkin-Elmer Corp.
Ruska & Co.
Scherr Co.
United Cinephone Corp.
Vinco Corp.
Zeiss, Inc., Carl

GAGES, Paint Film
American Inst. Co.
General Elec. Co.
Hathaway Inst. Co.
Instrument Specialties Co.
Metron Instrument
Munsell Color Co.
Saxl Inst. Co.

GAGES, Paper Thickness (See Gages, Thickness)

GAGES, Piston Ring
Amer. Measuring Insts.
Elgin National Watch
Federal Products Corp.
Littelfuse Inc.
Merz Engineering
Wilkening Mfg. Co.

GAGES, Pitch Diameter
Acme Industrial
Brown & Sharpe
Cole Instrument
Detroit Tap & Tool
DoAll Co.
Federal Prod. Corp.
Greenfield Tap & Die
Lufkin Rule Co.
Master Gauge
Merz Engineering
Pratt & Whitney
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Starrett Co.
Union Tool Co.
Van Keuren Co.
Vinco Corp.
West & Dodge Thr. Gage
Woodworth Co.

GAGES, Plug
Acme Industrial
American Gauge Co.
Amer. Measuring Insts.
Axelson Mfg.
Barker Tool Die
Brown & Sharpe
Cole Instrument
Corning Glass Works
Detroit Tap & Tool
DoAll Co.
Elgin National Watch
Ford Motor Co.
Fox Munitions
Greenfield Tap & Die
Lawrence & Hill
Lincoln Park Industries
Master Gauge
Merz Engineering
(Cont'd)

GAGES, Plug (Cont'd)
Morse Twist Drill
Norton Co.
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Saxl Instrument
Sheffield Corp.
Size Control Co.
Standard Gage
Swedish Gage
United Precision Prod.
Vard, Inc.
Vinco Corp.
West & Dodge Thr. Gage
Woodworth Co.

GAGES, Pneumatic Tank
Bacharach Industrial
Barton Inst. Co.
Foxboro Co.
Gauthier, Donat A.
Marsh Corp.
Mason-Neilan Regulator
Pneumercator Co.
Rochester Mfg. Co.
Star Brass
Uehling Inst. Co.

GAGES, Precision Measuring
Acme Industrial
Ames Co., B. C.
Amer. Measuring Insts.
Brown & Sharpe
Carson Micrometer
Cole Instrument
Comtor Co.
Dearborn Gage Co.
Elgin National Watch
Federal Prod. Corp.
Ferner Co.
Ford Motor Co.
Fox Munitions
Gauthier, Donat A.
General Elec. Co.
Hays Corp.
Jansson Gage Co.
Lufkin Rule Co.
Master Gauge
Merz Engineering
Metron Instrument
Moore Products
Physicists Research
Poole Manufacturing
Pratt & Whitney
Rieker Instrument Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
Swedish Gage
Taco Engineering
Thwing-Albert Inst. Co.
United Precision Prod.
Van Keuren Co.
Vinco Corp.
Webber Gage Co.
Woodworth Co.
Carl Zeiss, Inc.

GAGES, Pressure, Indicating
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American Meter Co.
Anderson Co.
Ashton Valve Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Baird Associates
Baldwin-Southwark Corp.
Bastian-Blessing
Belfield Co.
Boekel & Co.
Bristol Co.
Brown Inst. Co.
Brush Development Co.
Builders-Providence
Central Scientific Co.
Clapp Instrument
Clark Blast Meter
Clarkstan Corp.
Consol. Ashcroft Hancock
Consolidated Engg.
Continental Elec. Co.
Crosby Steam Gage
Defender Automatic Reg.
Dickson Co.
Dillon & Co.
Distillation Products
Dubrovin, John
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Edison Electrical Controls
Elmer & Amend
Electric Auto-Lite
Electro Products Labs
Electronic Products Co.
Elematic Equip. Corp.
Esterline-Angus Co.
Fisher Scientific Co.
Foxboro Co.
Fredericks, George
Friez & Sons
Fulton Syphon Co.
Gas Appliance Specialties
General Elec. Co.
Gordon Co., Claud S.
Gotham Inst.
Green, Henry J.
Hays Corp.
Heise Bourdon Tube
Helicoid Gage Div.
H & H Thermostats
Kollsman Inst. Div.
Kurman Electric
Logansport Machine
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp.
Marshalltown Mfg.
(Cont'd)

GAGES, Pressure Indicating (Cont'd)
Mason-Neilan Regulator
Mercoid Corp.
Meriam Co.
Metron Instrument
Moeller Instrument Co.
Moore Products
National Research
Northern Engraving
Parks Co., Harry S.
Perfex Corp.
Physicists Research
Pittsburgh Equitable Met.
Plumb Co., Inc.
Precision Gage & Tool
Precision Therm.
Preferred Utilities Mfg.
Ranco Inc.
RCA Manufacturing Co.
Refinery Supply Co.
Republic Flow Meters
Rochester Mfg. Co.
Scientific Glass App.
Scientific Inst. Co.
Seely Inst. Co., Inc.
Star Brass Mfg. Co.
Statham Labs.
Stoelting Co., C. H.
Stokes Machine Co.
Superior Meter Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Trimount Instrument
Uehling Instrument Co.
United Cinephone Corp.
U. S. Gauge Co.
Victor Equipment Co.
Wagner & Son, Carl R.
Wallace & Tiernan (Low Pressure)
Waugh Labs.
Weksler Thermometer
Welch Scientific
Wheelco Instruments
Wilgus Manufacturing

GAGES, Pressure—Recording (See Gages, Pressure, Indicating)

GAGES, Pressure Temperature (See Gages, Pressure Indicating)

GAGES, Pressure, Tire
U. S. Gauge Co.

GAGES, Pressure & Vacuum (See Gages, Pressure Indicating)

GAGES, Profile
Acme Industrial
American Gage Co.
Amer. Measuring Insts.
Barker Tool Die
Cole Instrument
Fox Munitions
Foxboro Co.
General Elec. Co.
Jansson Gage Co.
Lincoln Park Industries
Master Gauge
Merz Engineering
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Sheffield Corp.
Size Control Co.
Stockton Profile Gauge
Swedish Gage Co.
Taco Engineering
United Cinephone Corp.
Vinco Corp.
Woodworth Co.

GAGES, Radius
Acme Industrial
Barker Tool Die
Cole Instrument
Ford Motor Co.
Lufkin Rule Co.
Master Gauge
Size Control Co.
Starrett Co.
Swedish Gage Co.
United Cinephone Corp.
Vinco Corp.
Woodworth Co.

GAGES, Rain (See Rain Gages)

GAGES, Rifle Bore
Baldwin Southwark
Federal Products Corp.
Fox Munitions
Gauthier, Donat Co.
Hathaway Inst. Co.
Moore Products
Poole Mfg. Engrs.
Pratt & Whitney
Sheffield Corp.
Size Control Co.
Vinco Corp.

GAGES, Ring
Acme Industrial
Allen Gauge & Tool Co.
American Gage Co.
Amer. Measuring Insts.
Axelson Mfg.
Barker Tool Die
Brown & Sharpe
Cole Instrument
Corning Glass Works
Detroit Tap & Tool
Elgin National Watch
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Gauthier, Donat A.
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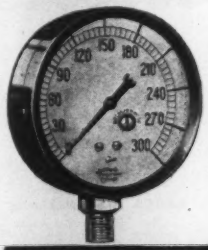

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Morse Twist Drill
Norton Co.
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Saxl Instrument
Sheffield Corp.
Standard Gage
Swedish Gage Co.
Vinco Corp.
West & Dodge Thread
Woodworth Co.
Worley Jewel Co.
Zeiss, Inc., Carl

GAGES, Screw Thread
Acme Industrial
Allen Gauge & Tool Co.
Axelson Mfg.
Brown & Sharpe
Bryant Chk. Grinder
Clark, Jr. Pneumatic Tool
Cole Instrument
Detroit Tap & Tool
Federal Prod. Corp.
Fox Munitions
Greenfield Tap & Die
Jansson Gage Co.
Lincoln Park Industries
Lufkin Rule Co.
Merz Engineering
Millers Falls Co.
Pratt & Whitney
Reed Small Tool Works
Sheffield Corp.
Size Control Co.
Starrett Co.
Union Tool Co.
Vard, Inc.
Vinco Corp.
West & Dodge Thread
Woodworth Co.
Zeiss, Inc., Carl

GAGES, Sliding
Acme Industrial
Amer. Measuring Insts.
Lufkin Rule Co.
Pratt & Whitney
Van Keuren Co.

GAGES, Snap
Acme Industrial
Allen Gauge & Tool Co.
American Gage Co
Amer. Measuring Insts.
Barker Tool Die
Brown & Sharpe
Cole Instrument
Detroit Tap & Tool
Federal Products Corp.
Fox Munitions
Gauthier, Donat A.
Gen. Engg. & Model Wks
Greenfield Tap & Die
Jansson Gage Co.
Lawrence & Hill
Lincoln Park Tool
Master Gauge
Merz Engineering
M-G Gage Corp.
Norton Co.
Pratt & Whitney
Precision Gage & Tool
R & M Mfg. Co.
Scherr Co.
Sheffield Corp.
Size Control Co.
Standard Gage
Vard, Inc.
Vinco Corp.

GAGES, Spline
Acme Industrial
Brown & Sharpe
Fox Munitions
Merz Engineering
Pratt & Whitney
Precision Gage & Tool
Sheffield Corp.
Size Control Co.
Standard Gage
Vinco Corp.

GAGES, Star
Gauthier, Donat A.
Moore Products
Pratt & Whitney

GAGES, Strain
Acme Industrial
American Inst. Co.
Bailey Meter Co.
Baldwin-Southwark
Cole Instrument
Consolidated Engg.
Fitzgen Co.
Electronic Products Co.
Federal Products Corp.
Gauthier, Donat A.
General Elec. Co.
Hathaway Inst. Co.
Heiland Research
Metron Instrument
Metzger & Son
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Olsen Testing Machine
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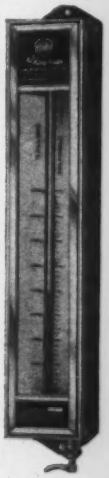

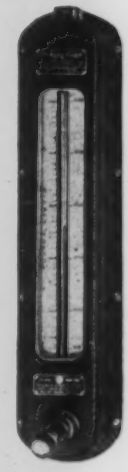

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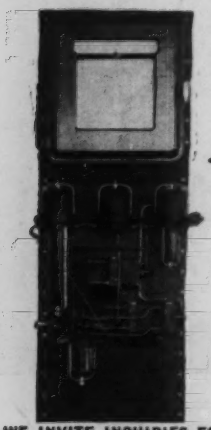
DEPENDABLE LABOR-SAVING SINGLE . . . or MULTI-POINT RECORDS



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Provides simultaneous analysis and continuous graphic record of the amounts of O_2, CO_2, CO, H_2 and CH_4 in a sample of combustion products. Enables close control in chemical processes, oil refining, kilns, inert gas producers, furnaces in the metallurgical industry and other combustion processes.

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Barker Tool Die
Brown & Sharpe
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Federal Prod. Corp.
Fox Munitions
Genales, Andrew
Janson Gage Co.
Lufkin Rule Co.
Millers Falls Co.
Optron Laboratory
Physicists Research
Precision Scientific
Saxl Inst. Co.
Standard Gage
Starrett Co.
Vinco Corp.
Zeiss, Inc., Carl

GAGES, Surface Finish Checking
Surface Checking Gage

GAGES, Taper
Acme Industrial
American Gage Co.
Barker Tool Die
Brown & Sharpe
Elgin National Watch
Federal Prod. Corp.
Fox Munitions
Gauthier, Donat A.
Lincoln Park Tool
Merz Engineering
Micro Master Co.
Norton Co.
Poole Mfg. Co.
Precision Gage & Tool
Pratt & Whitney
R & M Mfg. Co.
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GAGES, Taper (Cont'd)
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
United Precision Prod.
Vard, Inc.
Vinco Corp.
Woodworth Co.

GAGES, Telescoping
Brown & Sharpe
Lufkin Rule Co.
Pacific Tool & Supply
Starrett Co.

GAGES, Thickness
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Amther Testing Inst. Co.
Barker Tool Die
Brown & Sharpe
Commercial Research
Eitzen Co.
Federal Prod. Corp.
Ford Motor Co.
Fox Munitions
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Glogau & Co.
Gen. Engg. & Model Wks.
General Elec. Co.
Hathaway Inst. Co.
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Lufkin Rule Co.
Magnetic Gauge Co.
Marshall Co.
Master Gauge
Merz Engineering
Metzger & Son
Millers Falls Co.
Moore Products
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Pratt & Whitney
Precision Gage & Tool
Precision Scientific Co.
Precision Therm. & Inst.
Randall, Frank E.
R & M Mfg. Co.
Saxl Inst. Co.
Sheffield Corp.
Size Control Co.
Speidel & Co.
Standard Gage
Starrett Co.
Suter, Alfred
Taco Engineering
Thwing-Albert Inst. Co.
Union Tool Co.
Van Keuren Co.
Vinco Corp.
Waltham Dial Gage
Westinghouse Elec.
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GAGES, Thickness, Magnetic
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Commercial Research
General Elec. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Magnetic Gauge Co.
Metron Instrument
Taco Engineering
Waugh Labs.

GAGES, Tide
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Ballauf Mfg. Co.
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GAGES, Water Level (See Gages, Liquid Level)

GAGES, Wind
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Ames Co., B. C.
Brown & Sharpe
Federal Prod. Corp.
Foxboro Co.
General Elec. Co.
Greenfield Tap & Die
Hathaway Inst. Co.
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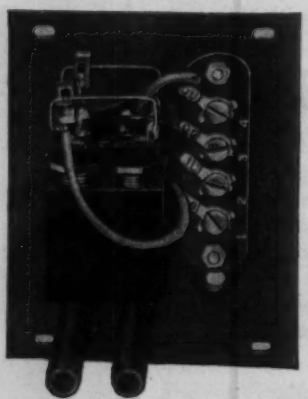

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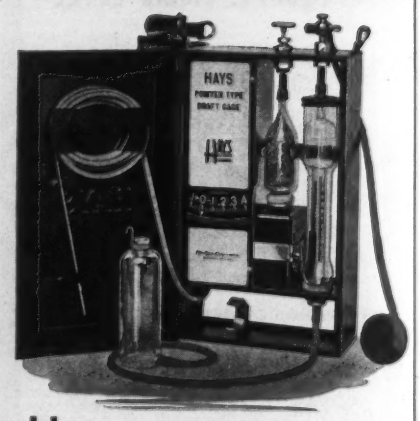

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Elgin National Watch
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Fox Munitions
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Master Gauge
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Consolidated Engg.
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Electro-Tec Div.
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Heiland Research
Hickok Elect. Inst. Co.
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Marion Electric Inst.
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Triplett Electrical Inst.
Waugh Labs.
Welch Scientific
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Weston Elec. Inst. Corp.
Wheelco Inst. Co.

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Magnetostriction Devices

GALVANOMETERS, Piezoelectric
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Cole Instrument
Waugh Labs.

GALVANOMETERS, Reflecting
Associated Research
Brush Development
Cole Instrument
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GALVANOMETERS, Reflecting (Cont'd)
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Heiland Research
Leeds & Northrup
Pfaltz & Bauer
Rawson Electrical Inst.
Rubicon Co.
Ruska & Co.
Thwing-Albert Inst. Co.
Waugh Labs.

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Electro Products Lab.
Engineering Labs., Inc.
Hathaway Instrument Co.
Heiland Research
Measurements Corp.
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National Technical Labs.
RCA Manufacturing
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Elmer & Amend
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Fisher Scientific Co.
Friez & Sons
General Elec. Co.
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Mine Safety Appliances
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Cambridge Inst. Co.
Davis Emergency Equip.
Engelhard, Chas.
General Elec. Co.
Mercoid Corp.
Permutit Co.
Sargent & Co.
Tagliabue Div.

GAS ANALYZERS, Carbon Dioxide
Ace Glass Inc.
Bacharach Industrial Inst.
Bailey Meter Co.
Baird Associates
Brown Inst. Co.
Burrell Tech. Supply
Cambridge Inst. Co.
Central Scientific Co.
Cole Instrument
Davis Emergency Equip.
Defender Automatic Reg.
Dwyer Mfg. Co.
Elmer & Amend
Ellison Draft Gage Co.
Engelhard, Chas.
Fish-Schurman Co.
Fisher Scientific Co.
Friez & Sons
General Elec. Co.
Gordon Co., Claud S.
Gow-Mac Instrument
Hays Corp.
Hebler Co.
Laboratory Equip. Co.
Lantz-Phelps Corp.
Leeds & Northrup Co.
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Mine Safety App. Co.
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Potter Co.
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Preferred Utilities Mfg.
Republic Flow Meters
Sargent & Co.
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Scientific Inst. Co.
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Cambridge Inst. Co.
Central Scientific
Chicago Apparatus Co.
Cole Instrument
Eclipse Aviation
Elmer & Amend
Fish-Schurman Co.
Fisher Scientific
General Elec. Co.
Hays Corp.
Laboratory Equip. Co.
Leeds & Northrup Co.
Machlett & Son
Mine Safety Appliances
Sargent & Co.
Scientific Glass App.
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Precision Scientific
Willson Products, Inc.

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GAS ANALYZERS, Hydrocarbon
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Baird Associates
Burrell Tech. Sup.
Consolidated Eng.
Davis Emergency Equip.
Engelhard, Chas.
Fisher Scientific
General Elec. Co.
Precision Scientific

GAS ANALYZERS, Hydrogen
Bacharach Industrial Inst.
Burrell Technical Supply
Chicago Apparatus Co.
Engelhard, Chas.
Fisher Scientific
General Elec. Co.
Leeds & Northrup

GAS ANALYZERS, Hydrogen Sulphide
American Meter
Baird Associates
Burrell Technical Supply
Bushnell & Nevins
Cambridge Inst. Co.
Connelly Iron Sponge
Consolidated Engg.
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GAS ANALYZERS, Hydrogen Sulphide (Cont'd)
Davis Emergency Equip.
Elmer & Amend
Fisher Scientific
Johnson-Williams, Ltd.
Mine Safety Appliances
Rubicon Co.
Sargent & Co.
Scientific Glass Apparatus

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Cambridge Inst. Co.
Elmer & Amend
Engelhard, Chas.
Fisher Scientific
General Elec. Co.
Rubicon Co.
Sargent & Co.

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Bailey Meter Co.
Burrell Technical Supply
Central Scientific Co.
Chicago Apparatus Co.
Defender Automatic Reg.
Dwyer Mfg. Co.
Elmer & Amend
Ellison Draft Gage
Fish-Schurman Co.
Fisher Scientific Co.
Hays Corp.
Howe & French, Inc.
Machlett & Son
Precision Therm.
Sargent & Co.
Scientific Glass App.
Specialty Glass Co.

GAS ANALYZERS, Oxygen
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Burrell Technical Supply
Chicago Apparatus Co.
Cambridge Inst. Co.
Davis Emergency Equip.
Eclipse Aviation
Elmer & Amend
Hays Corp.
Hebler Co.
Leeds & Northrup
Mine Safety Appliances
Precision Scientific
Sargent & Co.
Scientific Glass App.
Superior Meter Co.
Tagliabue Div.

GAS ANALYZERS, Oxygen & Nitrogen Apparatus
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Burrell Technical Supply
Cambridge Inst. Co.
Central Scientific Co.
Davis Emergency Equip.
Elmer & Amend
Fisher Scientific
Hays Corp.
Hebler Co.
Laboratory Equip. Co.
Mine Safety App. Co.
Precision Scientific
Sargent & Co.
Scientific Glass App.
Tagliabue Div.

GAS ANALYZERS, Sulphur Dioxide
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Baird Associates
Burrell Tech. Sup.
Bushnell & Nevins
Cambridge Inst. Co.
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GAS ANALYZERS, Sulphur Dioxide (Cont'd)
Davis Emergency Equip.
Elmer & Amend
Engelhard, Chas.
Fish-Schurman Co.
Hebler Co.
Laboratory Equip. Co.
Leeds & Northrup Co.
Precision Scientific
Sargent & Co.
Scientific Glass App.
Tagliabue Div.
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Foxboro Co.
Hays Corp.
Mason-Neilan Regulator
Meriam Co.
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GAS METERS, INFERENTIAL — Area (See Flowmeters, Area)

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GAS METERS, INFERENTIAL—Orifice (See Flowmeters, Orifice and Nozzle)

GAS METERS, INFERENTIAL — Pitot-tube (See Flowmeters, Pitot-tube)

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. . . Also adaptable for determining purity of

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COMPACT AND PORTABLE, the new Model 120-A CAMBRIDGE EXHAUST GAS TESTER is a precision instrument designed for testing internal combustion engines. By analysis of the exhaust gas, it continuously indicates the precombustion air-fuel ratio of the mixture supplied to the engine. This new gas analyzer is not only accurate, but it has proved sufficiently rugged to meet the exacting demands of military service. The instrument case (7⅛"x6½"x9") is robust, dustproof and essentially waterproof. Although designed primarily for automotive work, this portable instrument may be modified to analyze other gases, determining their purity, etc., etc.

CAMBRIDGE INSTRUMENT COMPANY, INC.
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It inspects *and* records gear accuracy—*the*

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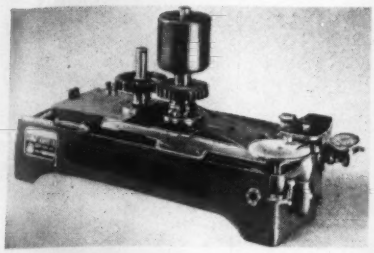
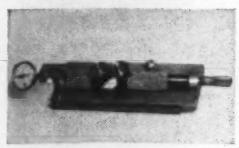


The quick, sure method to detect gear errors before costly rejections occur. Sensitive floating carriage riding on balls shows errors in pitch line, center distance, toothspacing and involute and shows up backlash, off-center tooth condition, etc. On critical gears a wax covered paper record can be made for reference should gear fail to perform well due to wrong center distance or other fault of installation.



For small gears, the Scherr Gear Testing Fixture. Run-out shows on dial gage. Center distance set by micrometer.

Write for descriptive bulletin on these gear testers.

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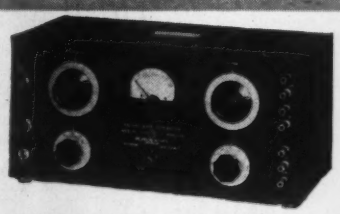

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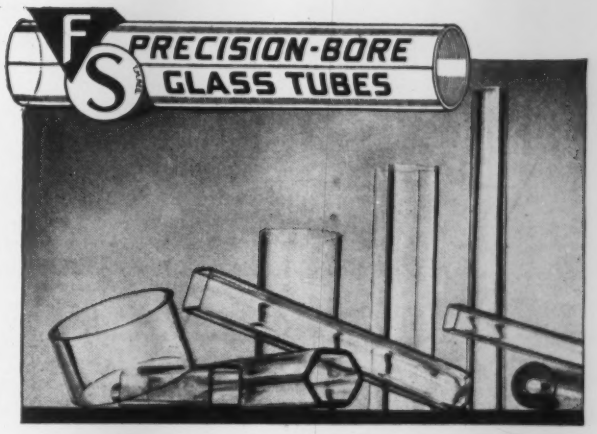

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(See Needles, Gillmore)

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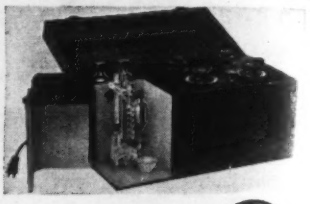

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Balance

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GOVERNORS, Pump (See Regulators, Automatic, Air)

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General Elec. Co.
Taco Engineering
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Gorrell & Gorrell
Impact Register
Thwing-Albert Inst. Co.
Waugh Labs.

IMPACT TESTING MACHINES (See Testers & Testing Machines, Impact)

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Lackner Co.
Moeller Inst. Co.
Trimount Inst. Co.

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Moeller Inst. Co.
Precision Therm.
Rieker Inst. Co.
Ruehfel Co.
Ruska & Co.
Schwein Engineering
Starrett Co.
Taco Engineering
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Illiey Elec. (Quartz Crystal)
Electro Products Labs
Rowe Radio Research
Sperry Gyroscope
Trimount Inst. Co.

INDICATORS, DIRECTION (Radioactuated)
Cardwell Mfg. Co.
Harvey Radio Labs.
Kollsman Instrument
Polarad Electronics

INDICATORS, Engine
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Bacharach Industrial Inst.
Baldwin-Southwark Corp
Bendix Marine Products
Cambridge Inst. Co.
Commercial Research
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Crosby Steam Gage Co.
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Baldwin-Southwark Corp
Cambridge Inst. Co.
Cole Instrument
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Electro Products Labs
Instrument Lab. Inc.
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RCA Manufacturing Co.
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American Inst. Co.

INDICATORS, Multiple Recording
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Eclipse-Pioneer Div.
Taylor Inst. Co.
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INDICATORS, Time Interval see Timers, Automatic, Interval

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Gauthier, Donat A.
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INSPECTION EQUIPMENT, Bore Hole (See Telescopes, Bore, Inspection)

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Marshall Co.
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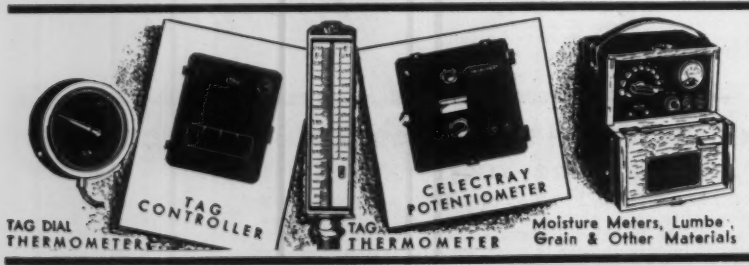

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General Scientific
Geophysical Inst. Co.
Glendale Optical
Henson Co., Fred C.
Mogey & Sons
Perkin-Elmer Corp.
Ruska & Co.
Simpson Optical
Swain Nelson Co.
Tinsley Laboratories
Unertl Optical Co.
Univis Lens Co.

LENSES, Burette
Central Scientific Co.
Elgin National Watch
Fish-Schurman Co.
Fisher Scientific Co.
Gaertner Scientific
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Fish-Schurman Corp.
Gaertner Scientific
General Scientific
Glendale Optical
Mogey & Sons
National Research Corp.
Plummer & Kershaw
Simpson Optical
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Zenith Optical

LENSES, Microscope, etc.
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Bausch & Lomb Optical
Binswanger & Co.
Boehmke Optical Co.
Bray Optical Co.
Buehler, Adolph I.
Fish-Schurman Corp.
Gaertner Scientific Corp.
General Scientific
Geophysical Inst. Co.
Glendale Optical
Henson Co., Fred C.
Leitz, Inc.
Mogey & Sons
Penn Optical & Inst.
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Plummer & Kershaw
Ruska & Co.
Simpson Optical
Swain Nelson Co.
Unertl Optical Co.
Univis Lens Co.
Zeiss, Inc., Carl

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Bausch & Lomb
General Scientific
Henson Co., Fred C.
Pfaltz & Bauer, Inc.
Polarizing Inst. Co.
Valpey Crystals
Woermann-Schuchhardt
Zeiss, Inc., Carl

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LEVELS, Dumpy (See Surveying Instruments)

LEVELS, Engineer's (See Surveying Instruments)

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Bostrom-Brady
Bruning Co., Inc.
Dietzen Co.
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Keuffel & Esser Co.
Leupold & Stevens
Millers Falls
Pittsburgh Inst. & Mach.
Starrett Co.
United States Blue Print
Warren-Knight Co.
Weber Co., F.
White Co. Inc., David

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Berger & Sons
Fecker, J. W.
Ferner Co.
Fish-Schurman Co.
Glogau & Co.
Gurley, W. & L. E.
Holland Research
Kern Co.
Keuffel & Esser Co.
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Rieker Instrument Co.
Scherr Co., Inc.
Starrett Co.
Warren-Knight Co.
Weber Co., F.
White Co. Inc., David
Zeiss, Inc., Carl

LEVELS, Prism
Berger & Sons
Fecker, J. W.
Kern Co.
Keuffel & Esser Co.
Taylor Inst. Cos.
White Co. Inc., David

LEVELS, Spirit
Dietzen Co.
Electronic Products
Ferner Co.
Geier & Bluhm, Inc.
Glogau & Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Ruehfel Co.
Stafford Co.
Warren-Knight Co.
White Co., Inc., David

LEVELS, Surveying (See Surveying Instruments)

LEVELS, Wye (See Surveying Instruments)

LIGHT METERS (See Photometers, Illumination)

LIGHT SOURCES see also Gas & Vapor Discharge Tubes

LIGHT SOURCES, "Daylight"
Continental Electric
General Elec. Co.
Macbeth Daylighting Co.

LIGHT SOURCES, Incandescent
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Fisher-Pierce Co.
Fredericks, George
Gaertner Scientific Co.
General Elec. Co.
G-M Labs.
Leitz, Inc., E.
United Cinephone Corp.

LIGHT SOURCES, Monochromatic
Acme Industrial
American Inst. Co.
Baird Associates
Bausch & Lomb Opt.
Buehler, Adolph I.
Central Scientific Co.
Dearborn Scientific
Fish-Schurman Co.
Fuess, Inc.
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Optron Laboratory
Pfaltz & Bauer, Inc.
Polarizing Instrument
Rudolph & Sons
Scherr Co., Inc.
Van Keuren Co.
United Cinephone Corp.

LIGHT SOURCES, Ultra-Violet
American Inst. Co.
Atlas Electric Devices
Baird Associates
Central Scientific Co.
Continental Electric
Dietert Co.
Electronic Products
Fredericks, George
Gaertner Scientific Corp.
General Elec. Co.
General Physical Lab.
Hanovia Chem. & Mfg.
Jarrell-Ash Co.
Laboratory Specialties,
Leitz, Inc.
Magnaflux Corp.
Mico Instrument Co.
Pfaltz & Bauer, Inc.
Photovolt Corp.
Ultra-Violet Products
United Cinephone Corp.
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LIGHT SOURCES, White Light
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General Elec. Co.
General Physical Lab.
United Cinephone Corp.
Westinghouse Elec. & Mfg.

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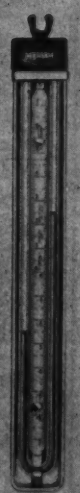

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Geophysical Inst. Co.
Heiland Research
Ruska Inst. Corp.
Triplett Elec. Inst.
Welch Mfg. Co.

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Central Scientific
Cinaudagraph Corp.
General Elec. Co.
Gen. Magnetic Corp.
Indiana Steel Products
Mellaphone Corp.
Westinghouse Elec.

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MALT TESTING APPARATUS (See Testers, Malt)

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Daniel Orifice Fitting
Electronic Products Co.
Foxboro Co.
Hays Corp.
Manning, Maxwell & Moore
Meriam Co.
Precision Scientific
Refinery Supply
Taco Engineering
Taylor Inst. Co.
Trerice Co.
Trimount Inst. Co.

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American Blower Corp.
Bacharach Industrial Inst.
Bailey Meter Co.
Builders-Providence
Defender Automatic Reg.
Detroit Air Meter Co.
Distillation Products
Dwyer Mfg. Co.
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Hays Corp.
H-B Inst. Co.
Manning, Maxwell & Moore
Meriam Co.
Moeller Inst. Co.
Precision Scientific
Precision Therm.
Taco Engineering
Trimount Inst. Co.
Uehling Inst. Co.

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Cambridge Inst. Co.
Commercial Research
Fuess, Inc.
Hathaway Instrument
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Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
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Cole Instrument
Connelly Iron Sponge Co.
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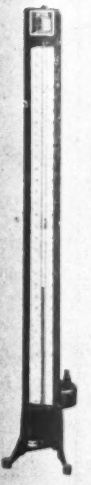
WELL TYPE MANOMETERS



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Trimount Inst. Co.
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Wallace & Tiernan

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Brown Inst. Co.
Builders-Providence
Electronic Products Co.
Gorrell & Gorrell
Precision Therm.
Republic Flow Meters
Southw'n Electronics Labs.
Taco Engineering
Taylor Inst. Co.
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MANOMETERS, U-tube, Glass
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American Meter Co.
Annis Co.
Bacharach Industrial Inst.
Barton Inst. Co.
Builders-Providence
Cole Instrument
Connelly Iron Sponge
Continental Equip. Co.
Defender Automatic Reg.
Detroit Air Meter Co.
Distillation Products
Dwyer Mfg. Co.
Elmer & Amend
Electronic Products
Fischer & Porter
Fish-Schurman Co.
Fisher Scientific Co.
Fredericks Co., Geo.
Friez & Sons, Julien
Gorrell & Gorrell
Gumam Inst.
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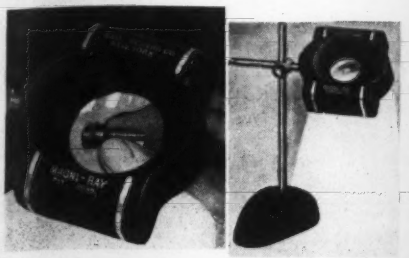

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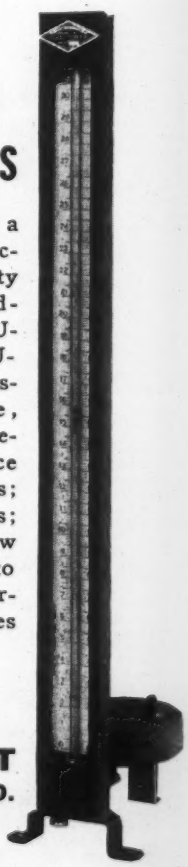

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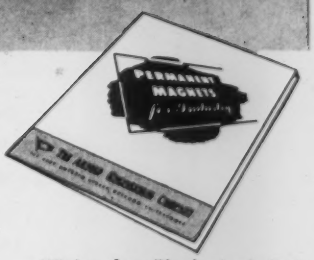

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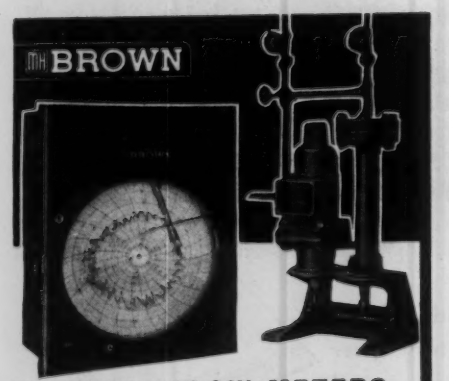

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For Recording, Indicating, Totalizing and Controlling the flow of fluids such as Steam, Water, Gas, Oil, etc.

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Taco Engineering
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Roth Bros. Chronometer
United States Blue Print
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MARINE INSTRUMENTS, Gyro-Compass & Gyro-Pilot, Electro-Mechanical Steering Systems
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Eclipse-Pioneer Div.
Sperry Gyroscope Co.

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Bausch & Lomb Opt.
Durant Mfg. Co.
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Ferner Co.
Fidelity Mach. Co.
Gaertner Scientific Corp.
Pratt & Whitney
Size Control Co.

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Durant Mfg. Co.
Federal Products Corp.
Federal Telegraph Co.
Ferner Co.
Kellogg Switchboard
Minneapolis Elec. & Const.
Pratt & Whitney

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Cambridge Inst. Co.
Clough-Brengle Co.
Cole Instrument
Electronic Development
Electro Products Lab.
Electro-Tech Equip.
Freed Transformer
General Elec. Co.
General Radio Co.
Ill. Testing Labs.
Industrial Instruments
MacLeod & Hanopol
Martindale Electric Co.
Radio City Products
Rawson Electrical Inst.
RCA Manufacturing Co.
Reiner Electronics
Rowe Radio Research
Sensitive Research Inst.
Shalleross Mfg. Co.
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Stich Co., Inc.
Taco Engineering
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.
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Ferner Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Machlett & Son
Microchemical Service
Parr Instrument Co.
Pfaltz & Bauer, Inc.
Precision Scientific Co.
Scientific Glass Apparatus
Tagliabue Div.
Thwing-Albert Inst. Co.
Western Machinery Co.

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METALLIC BELLOWS (See Bellows, Metallic)

METALS, Thermostatic
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General Plate

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Am. Paulin System
Ferner Co.
Friez & Sons
Fuess, Inc.
General Elec. Co.
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Green, Henry J.
Moeller Instrument Co.
Northern Labs.
Precision Therm.
Stewart, M. C.
Taylor Inst. Cos.
Wallace & Tiernan
Weksler Thermometer
White Co.

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Commercial Iron Wks.
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Lambert Meter Co.
Pgh. Equitable Meter Co.
Superior Meter Co.

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Lufkin Rule Co.
Weber Co.

METERS, Acid (See Acidimeters)

METERS, Ampere Hour (See Ampere Hour Meters)

METERS, Coal (See Coal Meters)

METERS, Coin Operated
American Meter Co.
General Elec. Co.
International Register
Landis & Gyr, Inc.
Superior Meter Co.

METERS, Compressed Air
American Meter Co.
Bailey Meter Co.
Builders-Providence
Fischer & Porter
Mason-Neilan Regulator
N. J. Meter
Schutte & Koerting
Taylor Inst. Cos.

METERS, Condensation
Am. Dist. Steam Co.
Bailey Meter Co.
Buffalo Meter Co.
Central Station Steam
Fischer & Porter
Hensley Co.
Taylor Inst. Cos.

METERS, Conductivity (See Conductivity Meters)

METERS, Consumer's, Electric
Cole Instrument
General Elec. Co.
Westinghouse Elec.

METERS, Consumer's, Gas
American Meter Co.
Lambert Meter Co., Inc.
Superior Meter Co.

METERS, Current, Air & Gas
American Meter Co.
Fischer & Porter
Mason-Neilan Regulator
Pgh. Equitable Meter Co.
Schutte & Koerting

METERS, Current, Liquid
American Meter Co.
Bowser & Co.
Builders-Providence
Eclipse Aviation
Fischer & Porter
Keuffel & Esser Co.
Leupold & Stevens
Mason-Neilan Regulator
National Meter Co.
Neptune Meter Co.
Pgh. Equitable Meter Co.
Schutte & Koerting
Scientific Inst. Co. (Calif.)
Sparling, R. W.
Uehling Instrument Co.
Worthington-Gamon Meter

METERS, Decibel (See Sound Level Meters)

METERS, Demand, Electric
Associated Research
Electric Indicator Co.
Esterline-Angus Co.
General Elec. Co.
HD Elec. Co.
Landis & Gyr, Inc.
Sangamo Electric Co.
Triplett Elec. Inst.
Westinghouse Elec.

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Bailey Meter Co.
Bendix Marine Products
Lambert Meter Co.
Mason-Neilan Regulator
Pgh. Equitable Meter Co.
Superior Meter Co.

METERS, Demand Limiting, Automatic
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Annis Co.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
Mason-Neilan Regulator
Taco Engineering
Westinghouse Elec. & Mfg.

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Geophysical Inst. Co.
Heiland Research
Rawson Electrical Inst.
Shalleross Mfg. Co.
Westinghouse Elec.

METERS, Electronic
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Ballantine Labs.
Boonton Radio Corp.
Brown Inst. Co.
Cambridge Inst. Co.
Chicago Indust. Inst.
Clarke Inst. Corp.
Clippard Inst. Lab.
Clough-Brengle Co.
Cole Instrument
Electronic Development
Electro Products Lab.
Espey Mfg.
General Elec. Co.
General Radio Co.
Hathaway Instrument
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Kollsman Inst. Div.
Marion Electrical Inst.
Millen Mfg. Co.
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Sanborn Co.
Taco Engineering
Technicraft Engg.
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
Welch Scientific
Weston Elec. Inst. Co.
Wheelco Insts. Co.

METERS, Flow (See Flowmeters)

METERS, Fluorescence
Coleman Electric
Pfaltz & Bauer
Photovolt Corp.
Schaar & Co.
Taco Engineering

METERS, Footage (See Counters, Footage)

METERS, Foot-candle (See Foot-candle Meters)

METERS, Frequency (See Frequency Meters)

METERS, Gas (See Gas Meters)

METERS, Gas, Dry Test
American Meter Co.
Lambert Meter Co.
Pgh. Equitable Meter Co.
Republic Flow Meters
Superior Meter Co.
Tagliabue Div.

METERS, Gas, Integrating
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Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Lambert Meter Co.
Mason-Neilan Regulator
Republic Flow Meters
Superior Meter Co.
Taylor Inst. Cos.

METERS, Gas, Wet Test
American Meter Co.
Lambert Meter Co.
Precision Scientific
Superior Meter Co.
Tagliabue Div.
Taylor Inst. Cos.

METERS, Gas, Station
American Meter Co.
Bowser & Co.
Pgh. Equitable Meter Co.

METERS, Gasoline (See Meters, Liquid)

METERS, High Pressure & High Pressure Distribution
Buffalo Meter
Foxboro Co.
Pgh. Equitable Meter Co.
Republic Flow Meters
Simplex Valve & Meter

METERS, Hydrogen Ion (See Hydrogen Ion Determination Instruments)

METERS, LIGHT (See Foot-candle Meters, Illumination Indicators and Recorders, Light Meters, etc.)

METERS, Liquid, Volumetric Types, Nutating Piston or disk
Askania Regulator Co.
Badger Meter Co.
Brodie Co.
Buffalo Meter Co.
Hays Corp.
National Meter Co.
Neptune Meter Co.
Pgh. Equitable Meter
Read Machinery Co.
Worthington Gamon

METERS, Liquid, Volumetric Types, Oscillating Piston
Badger Meter Co.
Brodie Co., Inc.
National Meter Co.
Neptune Meter Co.
Worthington-Gamon Met.

METERS, Liquid, Volumetric Types, Propeller
Builders-Providence
Hensley Co.
Neptune Meter Co.
Sparling, R. W.

METERS, Liquid, Volumetric Types, Reciprocating Piston
Askania Regulator Co.
Bowser & Co., Inc.
Ralph N. Brodie Co., Inc.
Pgh. Equitable Meter
Ruska & Co., Inc.
Worthington Gamon

METERS, Liquid, Volumetric, Rotary Piston
Askania Regulator Co.
Badger Meter Co.
Bowser & Co., Inc.
Brodie Co.
Neptune Meter Co.
Pgh. Equitable Meter
Revere Co.
Smith Meter Co.

METERS, Liquid, Volumetric, Special for Extremely Low Flow
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Bowser & Co. Inc.
Commercial Research
Fischer & Porter
Fluid Meters, Inc.
Gauthier, Donat A.
Hays Corp.
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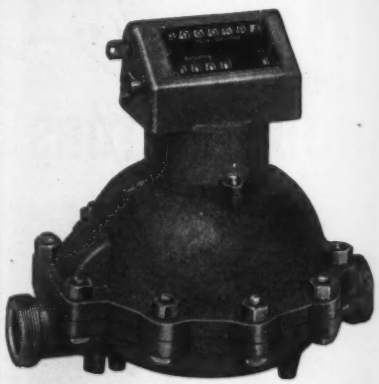

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- OILS
- SOLVENTS
- GASOLINE
- ALCOHOL

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Ohmer Register
Veeder-Root, Inc.

METERS, Multi-Rate
Landis & Gyr, Inc.

METERS, Oil (See Meters, Liquid)

METERS, Orifice (See Flowmeters, Orifice)

METERS, Oxygen (See 1—Gas Analyzer; 2—Gas Meters)

METERS, Pitot Tube (See Flowmeters, Pitot Tube)

METERS, Positive Displacement (See Gas Meters, Positive and Liquid Meters, Volumetric)

METERS, Prepayment
American Meter Co.
Landis & Gyr, Inc.

METERS, Proportional
American Meter Co.
Bristol Co.
Fischer & Porter
Foxboro Co.
Mason-Neilan Regulator
National Meter Co.
Pgh. Equitable Meter Co.
Proportioneers, Inc.
Republic Flow Meters
Sensitive Research Inst.
Taylor Inst. Cos.

METERS, Reactive Component
Andrew, Victor J.
Boonton Radio Corp.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
RCA Manufacturing
Triplett Elec. Inst.
Westinghouse Elec.
Weston Electrical Inst.

METERS, Rotary Displacement
Askania Regulator Co.
Bowser & Co.
Brodie Co.
Neptune Meter Co.
Pgh. Equitable Meter Co.

METERS, Sewage
American Meter Co.
Bailey Meter Co.
Bristol Co.
Builders-Providence
Leupold & Stevens
Mason-Neilan Regulator
Morey & Jones, Ltd.
Pgh. Equitable Meter Co.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.

METERS, Shunt
Builders-Providence
Burlington Inst. Co.
Cole Instrument
Columbia Elec. Mfg.
Daven Co.
Electronic Development
Electronics, Inc.
Instrument Resistors
Radio City Products
Rawson Electrical Inst.
Reiner Electronics
Shalleross Mfg.
Wheelco Inst. Co.
Westinghouse Elec.

METERS, Sight Flow
Bowser & Co., Inc., S. F.
Everson Mfg. Co.
Fischer & Porter Co.
Hennsey Co.
Schutte & Koerting
Selas Co.
Taco Engineering

METERS, Station
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METERS, Steam (See Flowmeters, Steam)

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Berkeley Scientific
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Cyclotron Specialties
Electronics, Inc.
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General Elec. Co.
Haydon Co.
Industrial Timer Corp.
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Paragon Electric Co.
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Rowe Radio Res. Lab.
Standard Elec. Time
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Waltham Watch
Warren Telechron Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

METERS, Ultraviolet Radiation
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Pfaltz & Bauer
Photovolt Corp.
Westinghouse Elec.

METERS, Venturi (See Flowmeters, Venturi)

METERS, V-notch (See Flowmeters, Weir)

METERS, Volumetric, Positive Displacement (See Gas Meters, Positive; see Meters, Liquid, Volumetric)

METERS, Water (See Liquid Meters, Volumetric; also Flowmeters, Liquid)

METERS, Watt-Hour
Associated Research
Cole Instrument
Duncan Electric
General Elec. Co.
Landis & Gyr, Inc.
Sangamo Electric Co.
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MICRODENSITOMETERS see Densitometers

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Eitzen Co.
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Gen. Engg. & Model Wks.
Glogau & Co.
Instrument Specialties
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Park **Sales**
Randall, **Frank E.**
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Size Control Co.
Starrett Co.
Waltham Dial Gage Co.

MICROMETERS, Electronic
Carson Micrometer
Poole Mfg. Engrs.
Taco Engineering

MICROMETERS, External
Carson Micrometer
Elgin National Watch
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MICROMETERS, Internal
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Pacific Tool & Supply
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Buehler, Adolph I.
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Jarrell-Ash Co.
Keuffel & Esser Co.
Leitz, Inc.
Rusks & Co.
Scherr Co., Inc.
Unertl Optical Co.
Zeiss, Inc., Carl

MICROMETERS, Radio
Panoramic Radio Co.
Sensitive Research Inst.

MICROPHONES
Amer. Automatic Elec.
Amperite Co.
Brush Development
Eby Inc., Hugh
Electro-Voice Mfg.
Kellogg Switchboard
Leich Electric
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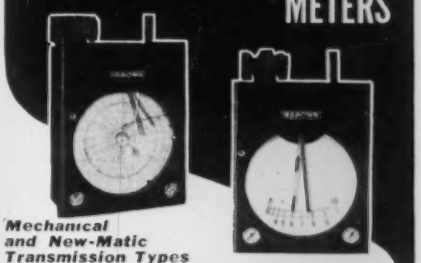
Sundt Engg.
Western Electric

FLOW AND LIQUID LEVEL METERS



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Brown Mechanical Flow Meters are used where it is convenient to locate the instrument close to the point of flow measurement. The meter body is mounted on the back of the instrument case and is connected to the instrument through a pressure-tight bearing.

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For detailed information consult Sweet's Engineering Catalogs or request a copy of bulletin No. 301.

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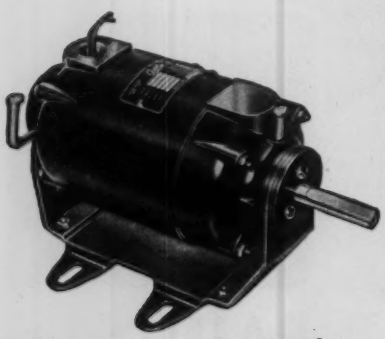

Specifications
- Motor Type KS-837
- Model I-S 225S
- Approx. 1/20 H.P.
- Speed 1140 R.P.M.
- 115 V. A.C. 60 cycles
- Split phase induction
- Continuous duty

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M-32

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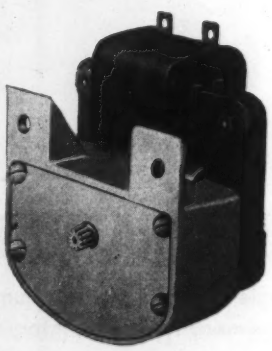

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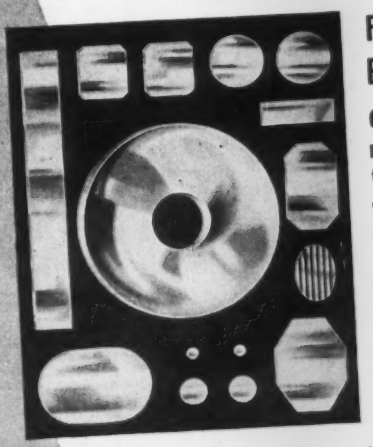

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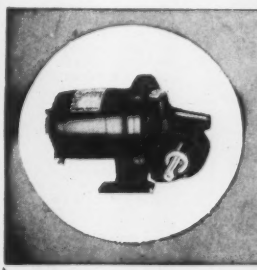

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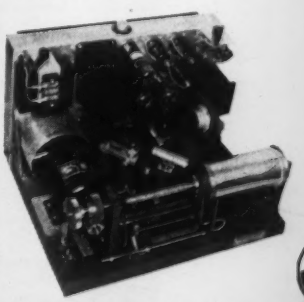

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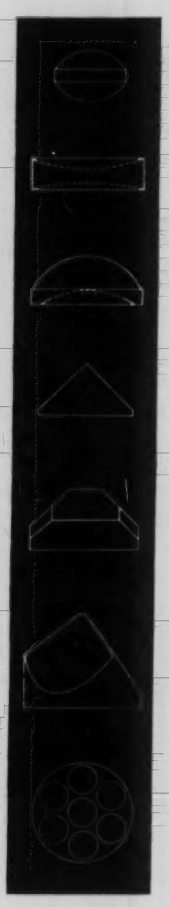

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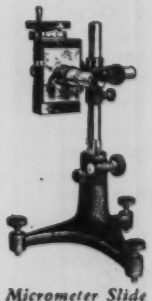

Micrometer Slide Cathetometer

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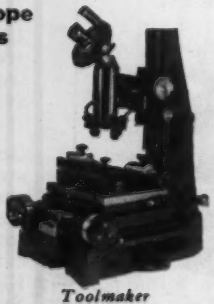

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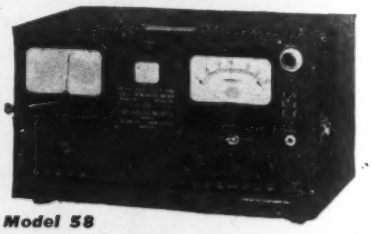

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Sargent & Co.
Scientific Glass Apparatus
Tagliabue Div.
Taylor & Co., W. A.

NOISE ANALYZING APPARATUS
Aerovox Corp.
Brush Development Co.
Electronic Design Corp.
General Radio Co.
RCA Manufacturing
Televiso Co.

NOISE FILTERS
Aerovox Corp.
Electro Products Labs.
Kellogg Switchboard
Rowe Radio Research
Tobe Deutschmann Corp.

NOISE MEASURING SETS
Amperite Co.
Ballantine Labs.
Daven Co.
Electronic Design Corp.
Ferris Inst. Corp.
General Elec. Co.
General Radio Co.
Measurements Corp.
Sound Apparatus Co.
Tobe Deutschmann Corp.
Waugh Laboratories
Western Electric

NOISE RECORDING APPARATUS
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Esterline-Angus Co.
General Radio Co.
RCA Manufacturing
Sound Apparatus Co.

NOZZLES, Flow
American Moistening Co.
Bacharach Indust. Inst.
Bailey Meter Co.
Brown Inst. Co.
Builders-Providence
Cochrane Corp.
Foxboro Co.
Republic Flow Meters
Simplex Valve & Meter
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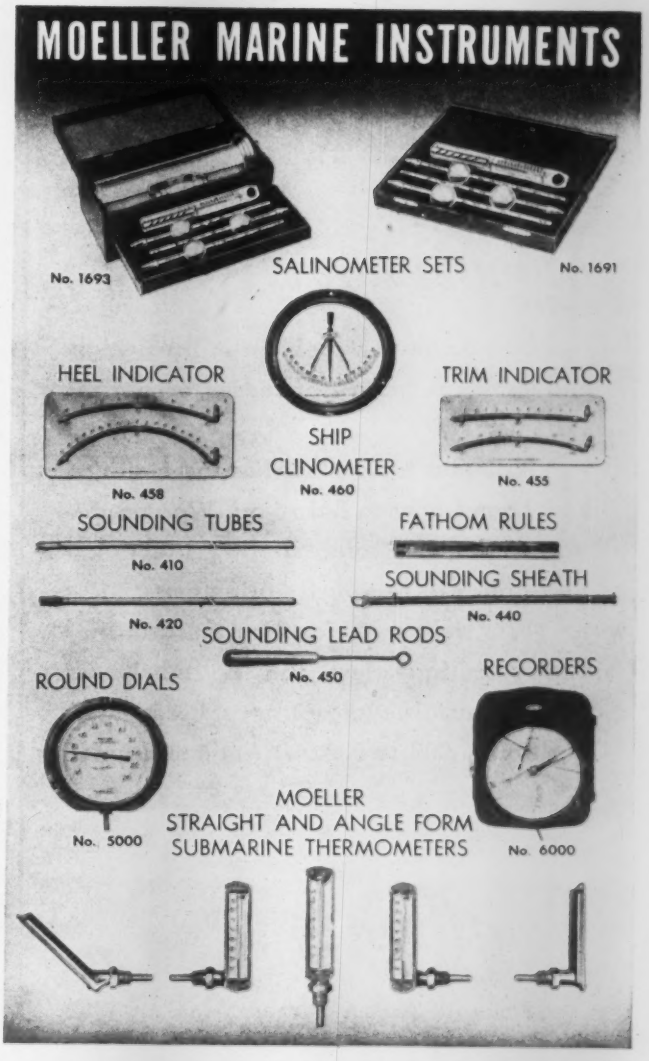
OCTANTS, NAVIGATING
Bausch & Lomb Optical
Eclipse-Pioneer Div.
Kuner Co., Max
Link Aviation Devices
Pioneer Instrument Co.

MOELLER MARINE INSTRUMENTS



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Knopf, Paul

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Burton Rogers Co.
Chicago Indust. Inst.
Clough Brengle Co.
Cole Instrument
De Jur-Amsco Corp.
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Electro-Tech Equip.
Espey Mfg.
General Elec. Co.
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Kellogg Switchboard
Leeds & Northrup Co.
M. B. Mfg. Co.
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RCA Manufacturing Co.
Reiner Electronics
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Shurite Meters
Simpson Elec. Co.
Sticht Co., Inc.
Taco Engineering
Triplett Elec. Inst.
V-D Instrument Lab.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

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Cole Instrument
Electronic Development
General Elec. Co.
Hickok Elec. Inst. Co.
Marion Electrical Inst.
Radio City Products
Rawson Elec. Inst. Co.
RCA Manufacturing
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Sensitive Research Inst.
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H-B Instrument Co.
Kimble Glass Co.
Precision Scientific

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Distillation Products
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Elgin National Watch
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Braun Corp.
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Cole Instrument
Cook Research Labs.
Eitzen Co.
Eimer & Amend
Fish-Schurman Co.
Fisher Scientific Co.
General Elec. Co.
H-B Instrument Co.
Humboldt Mfg. Co.
Industrial Inst. Inc.
Mico Instrument Co.
Moeller Instrument Co.
Moisture Register Co.
Parr Instrument Co.
Photovolt Corp.
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Refinery Supply
Ruehfel Co.
Ruska & Co., Inc.
Sargent & Co.
Scientific Glass App.
Scientific Inst. Co.
Tagliabue Div.
Taylor Inst. Cos.
Trimount Inst. Co.
Ultra-Violet Products
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Geophysical Inst.
Holland Research
Johnson-Williams, Ltd.
Sperry-Sun Well Survey.

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American Inst. Co.
Bausch & Lomb Opt.
Electronic Prod. Co.
Eimer & Amend
Gaertner Scientific
Photovolt Corp.
United Cinephone Corp.

OPERATION, Indicators
Bristol Co.
Brown Inst. Co.
Eclipse-Pioneer Div.
Elec. Tachometer Corp.
Foxboro Co.
Taco Engineering

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Abrams Instrument
American Automatic Elec.
Amthor Testing Inst. Co.
Autocall Co.
Bristol Co.
Brown Inst. Co.
Cole Instrument
Cramer & Co., Inc.
Dickson Co.
Elec. Tachometer Corp.
Esterline-Angus Co.
Foxboro Co.
Friez & Sons
Gaertner Scientific Corp.
Instrument Lab. Inc.
Knopf, Paul
Marsh Corp.
Paragon Electric Co.
Taco Engineering
Tagliabue Div.

OPTICAL BENCHES (See Benches, Optical)

OPTICAL FILTERS (See Filters, Optical)

OPTICAL FLATS (See Flats, Optical)

OPTICAL MICROMETERS (See Micrometers, Optical)

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Akatos, Inc.
Alpha Instrument Co.
American Optical
Baird Associates
Bausch & Lomb Optical
Binswanger & Co.
Bray Optical Co.
Clark & Sons
Dearborn Scientific
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
General Scientific
Geophysical Inst. Co.
Goerz Amer. Optical Co.
Hayward Optical Glass
Henson Co., Fred C.
Industro-Scientific Co.
Kern Co.
Kollmorgen Optical Co.
Leitz, Inc.
Machlett & Son
Master Optical Co.
Mellaphone Corp.
Mogey & Sons
Optron Laboratory
Penn Optical & Inst.
Perkin-Elmer Corp.
Plummer & Kershaw
Simpson Optical
Stafford Co.
Swain Nelson Co.
Tinsley Laboratories
Unertl Optical Co.
Univis Lens Co.

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Dearborn Scientific
Fish-Schurman Corp.
Gaertner Scientific
Geophysical Inst. Co.
Henson Co., Fred C.
Mogey & Sons
Optron Laboratory
Perkin-Elmer Corp.
Plummer & Kershaw
Thermal Syndicate Ltd.
Tinsley Laboratories
Unertl Optical Co.

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Scherr Co., Inc.
Zeiss, Inc., Carl

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Bausch & Lomb Opt.
Bell & Howell Co.
Clark Inst. Corp.
Eclipse Aviation
Elec. Indicator Corp.
Fecker, J. W.
Gaertner Scientific Corp.
General Elec. Co.
Holland Research
Kern Co.
Keuffel & Esser Co.
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Stafford Co.
Unertl Optical Co.
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Westinghouse Elec.

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Commercial Iron Works
Daniel Orifice Fitting
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Robinson Orifice Fitting
Simplex Valve & Meter

ORIFICES, CALIBRATED (See Flowmeters, Orifice)

ORIFICE PLATES (See Flowmeters, Orifice)

ORIFICES, ADJUSTABLE
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Bailey Meter Co.
Scientific Inst. Co.

ORSAT GAS APPARATUS (See Gas Analyzers, Orsat)

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LaMotte Chemical Prod.
Permutit Co.
Taylor & Co., W. A.

OSCILLATORS, Audio-frequency
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American Time Prods.
Amplifier Co.
Andrew, Victor J.
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Cambridge Inst. Co.
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Clippard Inst. Lab.
Clough-Brengle Co.
Cole Instrument
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Consolidated Engg.
Dayton Acme Co.
Electro-Medical Lab.
Electro Products Labs.
Electronic Design Corp.
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Electronic Prod. Co.
Espey Mfg.
Ferris Inst. Corp.
Freed Transformer
General Electric Co.
General Radio Co.
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Metron Instrument
Millen Mfg. Co.
Polarad Electronics
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RCA Manufacturing Co.
Reiner Electronics
Sherron Metallic
Supreme Instruments
Televiso Co.
Thordarson Elec. Mfg.
Trimount Inst. Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
United Cinephone Corp.
United Transformer Corp.
Waugh Laboratories
Western Electric

OSCILLATORS, Radio-frequency
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Burton-Rogers Co.
Cardwell Mfg. Co.
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Clippard Irst. Lab.
Clough-Brengle Co.
Cole Instrument
Crystal Research Labs.
Dayton Acme Co.
Electro-Medical Lab.
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General Radio Co.
Geophysical Inst. Co.
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Jackson Electrical Inst.
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Polarad Electronics
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Rowe Radio Research
Sherron Metallic
Simpson Elec. Co.
Sperry Gyroscope
Supreme Instruments
Taco Engineering
Televiso Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
United Cinephone Corp.
Western Electric
Weston Elec. Inst. Corp.

OSCILLOGRAPHS, Automatic
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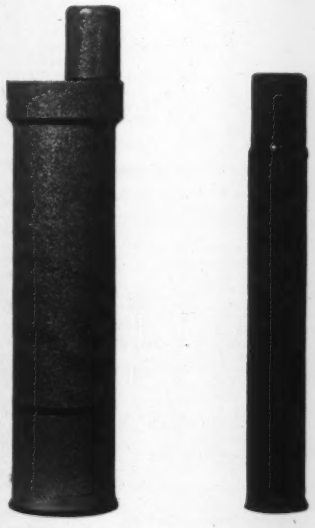

PRISMATIC TYPE

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DRAW TUBE TYPE

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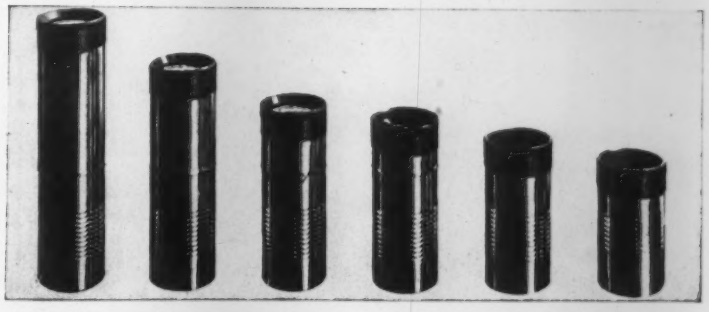
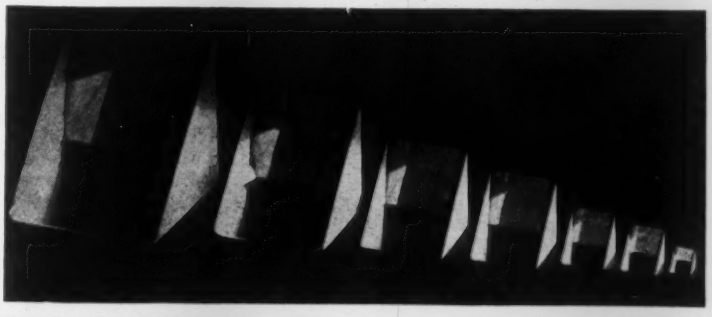
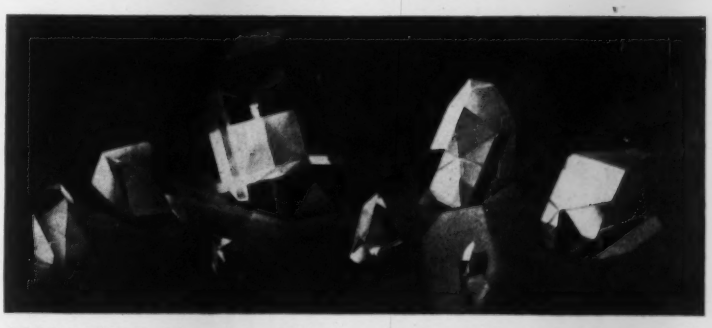


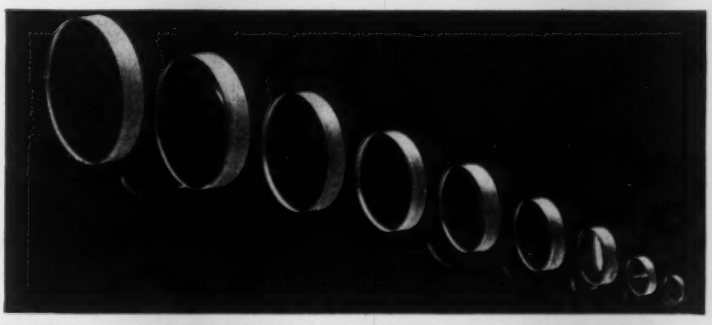
PROJECTION LENSES Complete line of commercial, high speed, color corrected projection lenses for 8mm, 16mm and 35mm film and slide projectors. Photo shows projection lenses, 35mm double frame, various focal lengths.



RIGHT ANGLE PRISMS Standard Right Angle Reflection Prisms manufactured in commercial quantities to specified angle and surface tolerances.



ROOF PRISMS Precision prisms with surfaces flat to one-millionth of an inch and with the ninety degree (90°) roof angle deviating from a true ninety degree angle by a maximum of 1/1800th part of a degree or within 1/648,000th part of a circle.



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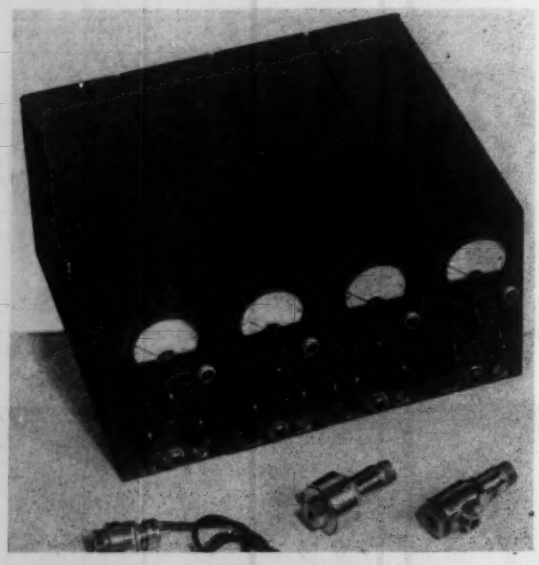

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Electro Products Lab.
Electronic Design Corp.
Frederiks, George
General Elec. Co.
General Radio Co.
Heiland Research
Hickok Elec. Inst. Co.
Jackson Electrical Inst.
Millen Mfg. Co.
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Supreme Instruments
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Triumph Mfg. Co.
United Transformer Corp.
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Waterman Prod. Co.
Waugh Labs.

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Cambridge Inst. Co.
Geophysical Inst. Co.
Hathaway Instruments
Heiland Research
Metron Instrument
Waugh Laboratories
Westinghouse Elec.

OSCILLOGRAPHS, Multi-element
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Brush Development
Cambridge Inst. Co.
Cole Instrument
Coleman Instrument
Consolidated Engg.
Electro-Medical Lab.
Engineering Labs., Inc.
General Elec. Co.
Geophysical Inst. Co.
Hathaway Instruments
Heiland Research
Metron Instrument
Rahm Instruments
Ruska & Co., Inc.
Waugh Laboratories
Westinghouse Elec.

OSCILLOGRAPHS, Piezo-electric
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Cambridge Inst. Co.
Electro-Medical Lab.
Engineering Labs.
Geophysical Inst. Co.
Heiland Research Corp
McFarlin Co.
Waugh Labs.

OSCILLOGRAPHS, Recording
Baldwin-Southwark Corp.
Brush Development Co.
Cambridge Instrument Co.
Cole Instrument
Coleman Instrument
Consolidated Engg.
Electro-Medical Lab.
Electro Products Lab.
Engineering Labs., Inc.
General Electric Co.
General Radio Co.
Geophysical Instrument Co.
Hathaway Inst. Co.
Heiland Research Corp.
Metron Instrument
Rahm Instruments
Ruska & Co., Inc.
Sound Apparatus Co.
Triumph Mfg. Co.
Waugh Laboratories
Westinghouse Elec.

OSCILLOSCOPES
Batcher, Ralph R.
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Clippard Inst. Lab.
Clough-Brengle Co.
Cole Instrument
Commercial Research
DuMont Labs., Inc., A.B.
General Elec. Co.
General Radio Co.
Jackson Electrical Inst.
Millen Mfg. Co.
Polarad Electronics
Radio City Products
RCA Manufacturing Co.
Reiner Electronics
Sherron Metallic
Sundt Engg. Co.
Supreme Instruments
Taco Engineering
Thordarson Elec. Co.
Triumph Mfg. Co.
United Transformer Corp.
Waugh Labs.

OUTPUT METERS
Brush Development
Chicago Indust. Inst.
Clippard Inst. Lab.
Clough-Brengle Co.
Cole Instrument
Daven Co.

(Cont'd)

OUTPUT METERS (Cont'd)
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Electronics, Inc.
Electro Products Lab
Espey Mfg.
General Elec. Co.
General Radio Co.
Hewlett-Packard
Jackson Electrical Inst.
M B Mfg. Co.
Radio City Products
RCA Manufacturing Co.
Reiner Electronics
Sensitive Research Inst.
Shalleross Mfg. Co.
Taco Engineering
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

OVENS, Controlled atmosphere
Amer. Gas Furnace
Fisher Furnace Co.
Precision Scientific
Sodemann Heat & Power

OVENS, Crystal Oscillator
Bliley Electric Co.
Federal Telegraph Co.
Fisher Furnace Co.
Premier Crystal Labs.
RCA Manufacturing
Valpey Crystals

OVENS, Laboratory
American Inst. Co.
Am. Gas Furnace
Boekel & Co.
Brabender Corp.
Braun Corp.
Buehler, Adolph I.
Burrell Tech. Supply
Central Scientific Co.
Dietert Co.
Elec. Heat Control App.
Electric Hotpack Co.
Fairstrom Co.
Federal Telegraph Co.
Ferner Co.
Fish-Schurman Co.
Fisher Furnace Co.
Fisher Scientific Co.
General Combustion Corp.
Goetze Niemer Co.
Gordon Co.
Haskins Mfg. Co.
Modern Kiln & Furn.
Precision Scientific
Sargent & Co.
Seedburo Equipment Co.
Sodemann Heat & Power
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OXYGEN ANALYZERS (See Gas Analyzers, Oxygen)

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Eclipse-Pioneer Div.
Grove Regulator
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OXYGEN DEMAND TESTING APPARATUS (See Gas Analyzers, Oxygen & Nitrogen Apparatus)

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Cash Co.
Eclipse-Pioneer Div.
Gaertner Scientific
Grove Regulator
Linde Air Products
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Nesser Co., Inc., L. G.

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Beck Bros.
Bristol Co.
Brown Inst. Co.
Cadillac Glass Co.
Clough-Brengle Co.
Cole Instrument
Daven Co.
Eclipse-Pioneer Div.
Elec. Tachometer Corp.
Electronic Development
Etched Products
Fairstrom Co.
Foxboro Co.
General Elec. Co.
Hays Corp.

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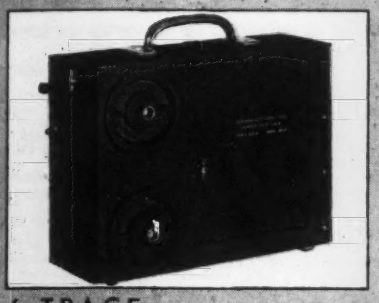
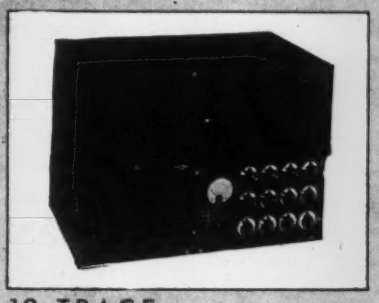
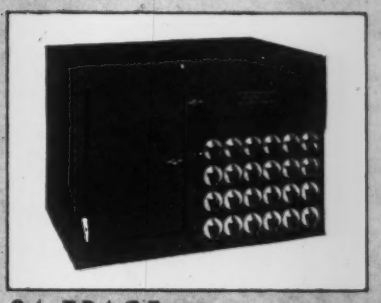


6 TRACE 12½ x 9½ x 4¼



12 TRACE 17 x 13 x 10



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Radio City Products
RCA Manufacturing
Reiner Electronics
Republic Flow Meters
Screenmakers, Inc.
Shallcross Mfg.
Stafford Co.
Stamford Metal Spec.
Standard Elec. Time
Tagliabue Div.
Taylor Inst. Co.
Trerice Co.
Triplett Electrical Inst.
Westinghouse Elec.

PANELS, Radio Test
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Burton-Rogers Co.
Clough-Brengle Co.
Cole Instrument
Daven Co.
Electronic Design Corp.
Electronic Development
Falstrom Co.
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PITOT TUBES (see Flowmeters, Pitot Tube)

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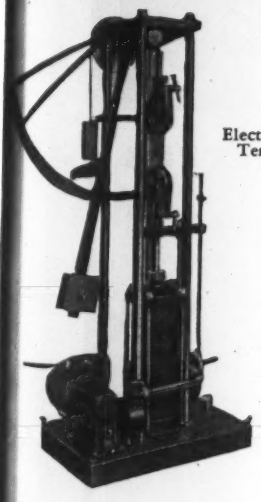

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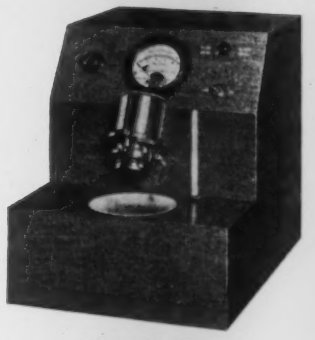

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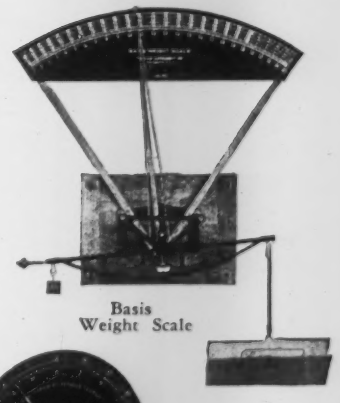
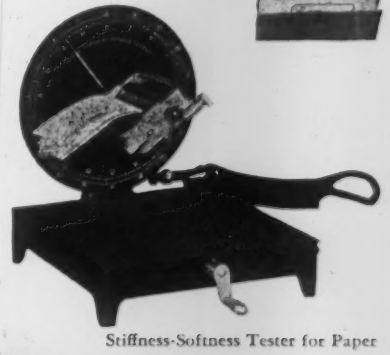


Basis Weight Scale



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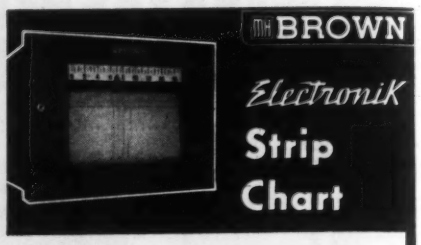

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Models are available for 1 to 16 different records, with 4½, 12 or 24 seconds full scale pen travel on a 12" wide chart. Calibrations are available for thermocouples, millivolts, radiation pyrometers, resistance thermometers, tachometers, spectrophotometers, pH and other variables.

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Auxiliary glass-enclosed mercury switches can be supplied in any one of six different switching actions.

Send for catalogs No. 15-8 and No. 15-9. Also see Brown ElectroniK Circular Chart Potentiometers in this section.

THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honneywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

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Marsh Corp. Jas P.
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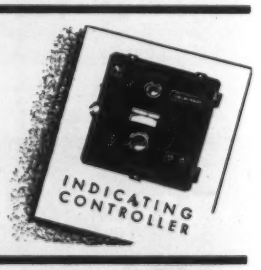
Do you want to control your laboratory furnace to 0.1°—0.01°—1 microvolt, or do you want a simple, rugged instrument that requires a minimum of attention for plant use? Then use a CELECTRAY Electrical Thermometer or Potentiometer . . . they alone utilize the high speed combination of photoelectric action—a beam of light, and a mirror galvanometer. Write for Catalog No. 1101-1.



PORTABLE PRODUCTS CORPORATION

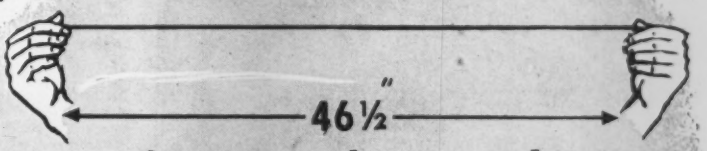
C. J. TAGLIABUE DIVISION **549 PARK AVE., BROOKLYN 5, N. Y.**

TAG

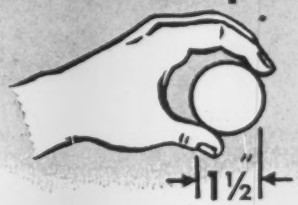
This new type potentiometer-rheostat...

Cutaway View of Helipot

puts this much slide wire



into this much panel space



It's the BECKMAN Helipot

(Trade mark for the HELIcal POTentiometer)

No matter what type quality electronic instrument you may be manufacturing or preparing to manufacture, be sure to investigate the *multiple* advantages you can build into your product by using Beckman Helipots for resistance control. Warperfected on such ultra-precision electronic equipment as radar, flight control instruments, depth sounding devices, etc., the Beckman Helipot makes possible entirely new standards of accuracy, convenience and compactness in resistance controls.

Unlike conventional potentiometers which consist of a single turn of slide wire, the Helipot has *many* turns of slide wire *helically* coiled into a compact case *that occupies no more panel space than a conventional single-turn potentiometer.* The slider contact is rotated by a knob in the usual manner and a simple device guides the slider contact as the knob is rotated so that the entire helical length of resistance winding can be contacted.

Its advantages are many. Heretofore circuits requiring precise control coupled with wide range have generally required at least two potentiometer units—one for coarse adjustment and the other for fine adjustment. This means *two* knobs to operate... *two* controls to waste panel space... *two* units to complicate installation and wiring. In the Beckman Helipot *both* wide range and fine adjustment are combined in the *one* unit. There is only *one* knob to operate... *one* unit to take up panel space... *one* control to install and wire. You not only save valuable panel space and assembly time, but you greatly increase the convenience, utility, simplicity and operating efficiency of your electronic instruments. Note these outstanding Helipot features...

High Linearity—As a result of fulfilling wartime requirements for ultra-precision circuit controls, Helipots are mass-produced with linearity tolerances of *one tenth of one per cent*—and even less!

Precise Settings—Because of the many times longer slide wire, settings can be made with an accuracy impossible with single turn units.

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Low Torque—Of special interest for power-driven applications—the Helipot has unusually low torque characteristics. The 1½" Helipot—for example—has a torque of *only one inch/ounce.*

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The Type B Helipot is 3" in diameter with 15 turns of slide wire as standard, but is available with either fewer or more turns on order. The 15 turns give a slide wire 140½" long.

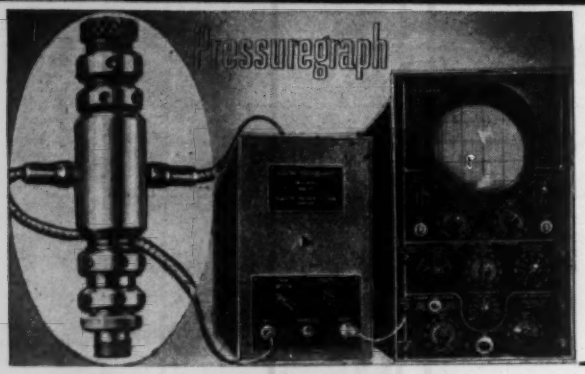
Resistance windings can be supplied in virtually any commercially available type of resistance wire for both Type A and Type B so that total resistance values for Type A range from 100 to 30,000 ohms... for Type B from 650 to 100,000 ohms.

SEND US YOUR POTENTIOMETER PROBLEM and our engineering staff will be glad to work with you in applying Helipot advantages to increase the efficiency, accuracy and convenience of your quality electronic instruments.

HELIPOT CORPORATION

1011 MISSION STREET, SOUTH PASADENA 8, CALIFORNIA

NOW! For Accurate Pressure-Time-Curve Measurements



Indicates accurately in linear response, on screen of cathode ray oscillograph, the pressure-time-curve of any internal combustion engine, pump, airline, or other pressure system where pressure measurements are desired. Covers wide range of engine speeds and pressures up to 10,000 p.s.i. Screws into cylinder and can be calibrated using static pressures. Vibration-proof. Accurate, dependable for engine tests.

SIMPLE OPERATION—ONLY ONE CONTROL

In operation the pick-up section (enlarged at left) is inserted in cylinder, chamber of airline, etc. Pick-up has temperature compensation for all normal operating conditions. Successfully used for tests of injection pumps, diesel and automotive engines, explosives, oil pumps and air compressors.

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Kollsman Inst. Div.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Moore Products
Morey & Jones, Ltd.
Perfex Corp.
Pioneer Instrument
Powers Regulator Co.
Republic Flow Meters
Rochester Mfg. Co.
Shallcross Controls
Taco Engineering
Tagliabue Div.
Taylor Instrument Cos.
Trerice Co.
Trimount Inst. Co.
Waugh Labs.

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Electro Products Lab.
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General Elec. Co.
Hathaway Instrument
Kurman Electric Co.
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Shallcross Controls
Statham Labs.
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Bristol Co.
Brown Inst. Co.
Dickson Co.
Foxboro Co.
Mason-Neilan Regulator
Republic Flow Meters
Shallcross Controls
Taco Engineering
Taylor Inst. Cos.
Uehling Inst. Co.

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Cook Electric
Dickson Co.
Mason-Neilan Regulator
Republic Flow Meters
Taco Engineering
Taylor Inst. Co.

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Brush Development Co.
Commercial Research
Crystal Research Labs.
RCA Manufacturing Co.
Waugh Labs.

PRESSURE INDICATORS, Piston, Weight-loaded
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Hagan Corp.
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Republic Flow Meters
Ruska & Co.

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Meriam Co.
Morey & Jones, Ltd.
Pioneer Instrument
Precision Therm.
Taco Engineering
Uehling Instrument Co.

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Commercial Research
Mansfield & Green
Taco Engineering

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Amthor Test. Mach.
Bacharach Indus. Inst.
Bailey Meter Co.
Connelly Iron Sponge
Detroit Air Meter Co.
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Electronic Products Co.
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Gas App. Specialties
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Moeller Instrument Co.
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Precision Therm.
Refinery Supply Co.
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Trerice Co.
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Uehling Instrument Co.

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Dickson Co.
Esterline-Angus Co.
Foxboro Co.
Gorrell & Gorrell
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Hays Corp.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
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Taylor Inst. Cos.
Weksler Thermometer

PRESSURE RECORDERS, Bourdon tube
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Baldwin-Southwark Corp.
Bristol Co.
Brown Inst. Co.
Electro Products Lab.
Builders-Providence
Crosby Steam Gage
Dickson Co.
Esterline-Angus Co.
Foxboro Co.
Gordon Co., Claud S.
Gotham Inst. Co.
Hays Corp.
Improved Gauge Mfg. Co.
Kenyon Instrument Co.
Leeds & Northrup Co.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
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Morey & Jones, Ltd.
Republic Flow Meters
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Tagliabue Div.
Taylor Inst. Cos.
Thrush & Co., H. A.
Trerice Co.
Weksler Thermometer

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Manning, Maxwell & Moore
Republic Flow Meters
Taco Engineering
Tagliabue Div.

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Bristol Co.
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Dickson Co.
Hays Corp.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Morey & Jones, Ltd.
Republic Flow Meters
Taco Engineering
Tagliabue Div.
Taylor Inst. Co.
Waugh Labs.
Wheelco Instruments

PRESSURE RECORDERS, Electrical-resistance
Cole Instrument
Electronic Engineers
Hathaway Instrument
Republic Flow Meters
Taco Engineering
Trimount Inst. Co.
Waugh Labs.

PRESSURE RECORDERS, Inverted-bell
American Meter Co.
Bacharach Indus. Inst.
Bailey Meter Co.
Bristol Co.
Dickson Co.
Foxboro Co.
Leeds & Northrup Co.
Mason-Neilan Regulator
Republic Flow Meters
Taco Engineering
Taylor Inst. Cos.
Uehling Instrument Co.

PRESSURE RECORDERS, Membrane
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Mason-Neilan Regulator
Republic Flow Meters
Taco Engineering
Taylor Inst. Co.

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RCA Manufacturing Co.
Waugh Labs.

PRESSURE RECORDERS, Piston, weight-loaded
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Trerice Co.
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Baldwin-Southwark Corp.
Commercial Research
Esterline-Angus Co.

PRESSURE RECORDERS, U-tube
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Brown Inst. Co.
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RCA Manufacturing
Spencer Lens Co.

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Bell & Howell Co.
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Fish-Schurman Corp.
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Eastern Science Co.
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Morehouse Machine Co.
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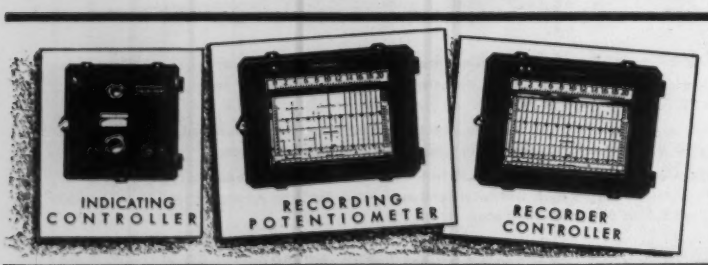


TAG CELECTRAY PYROMETERS

Better Temperature Control . . .
More Accurate Temperature Record

The simple, modern design of rugged CELECTRAY Pyrometers offers industry—

High Sensitivity Control—Accurate and Fast Recording. Write for Catalog No. 1101-1.

PORTABLE PRODUCTS CORPORATION

C. J. TAGLIABUE DIVISION 549 PARK AVE., BROOKLYN 5, N. Y.

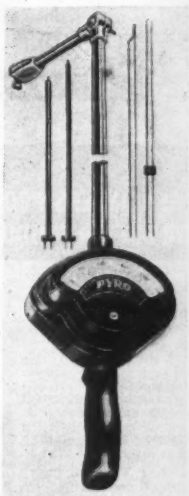
TAG

PYRO—FOR PRECISION TEMPERATURE MEASUREMENTS

The Simplified **PYRO OPTICAL** is the only self-contained, direct reading, accurate and dependable unit for quick and accurate high temperature measurements. Unique construction permits determinations even on **Minute Spots, Fast Moving Objects** or of the **Smallest Streams.** Special **Foundry Type** and **Universal Triple Range** have additional Red Scale for direct readings of **the true spout and** pouring temperatures of molten iron, steel, monel, etc., when measured in the open.

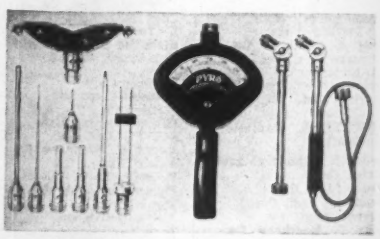
Stock Ranges from 1400°F to 7500°F Write for Catalog #80

The **NEW PYRO IMMERSION** represents the acme of ruggedness, accuracy and dependability and is **Indispensable** in any **Modern** non-ferrous **Foundry.** Constructed in a shock, moisture and dust-proofed shielded steel housing, it is immune to external magnetic influences and will withstand the roughest handling. "Bare metal" and "Protected" type thermocouples instantly interchangeable. Other features include the new, large 4¾" direct reading indicator, automatic cold end junction compensator and lock swivel.



Ranges 0-1500°F and 0-2500°F

Our Catalog #150 will interest you



The **NEW PYRO** all-purpose **Surface Pyrometer has** been designed to meet all plant and laboratory surface and subsurface temperature measurement requirements. Available in five temperature ranges from 0-300°F to 0-1200°F with a selection of eight types of interchangeable thermocouples and two extension arms. Also features automatic internal cold end junction compensator, shock, moisture and dust-proofed shielded steel housing.

Write for Catalog #160

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Green, Henry J.
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PSYCHROMETERS, Electric (See Psychrometers, Aspiration)

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Pyrometer Inst. Co.
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Scientific Glass App.
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De Jur-Amsco
Foxboro Co.
Leeds & Northrup Co.
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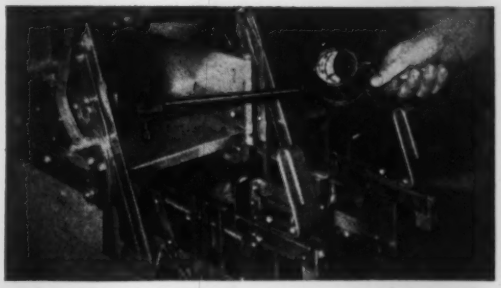


Alnor PYROCON

...the contact pyrometer for quick accurate surface temperatures . . .

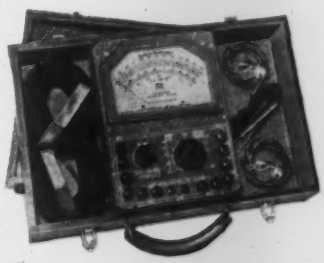
This convenient, all-purpose surface temperature pyrometer is ideally suited to a variety of industrial plant needs. Accurate temperature readings are obtained in a few seconds of plastic materials, liquids, oils, and similar materials, and of flat or curved, stationary or moving surfaces.

The Pyrocon shock-resisting movement is used with any one of eleven types of thermocouples, interchangeable without adjustment or re-calibration. Choice of rigid or flexible arms, or both, instantly interchangeable. Built in several standard ranges, 0-300 deg. F. to 0-1200 deg. F. Write for Bulletin 3511 giving complete description.

ILLINOIS TESTING LABORATORIES INC.
142 WEST HUBBARD STREET
CHICAGO 10, ILLINOIS

J-B-T

TEMPERATURE INDICATORS AND ACCESSORIES



Typical of this up-to-the-minute line of temperature indicating instruments is this combination resistance thermometer, pyrometer Model 60-JRT. It measures 4 cold zones with resistance bulbs, 2 heat zones with thermocouples, and AC line voltage with prods and clips. Three 5" scales read —100°F to 80°F, 0°F to 600°F, and 0—300 volts.

The line also includes compact oven pyrometers with 2⅜" scale in laboratory stand; units with 35' thermocouples for measuring surface temperatures of work in infra-red ovens; diesel engine pyrometers; 6" portables with or without thermocouple switches; 7" wall-mounting high temperature indicators; and a unique portable potentiometer-pyrometer which eliminates the standard cell and most balancing operations.

Matched thermocouples, connector blocks, protection tubes and resistance bulbs are stocked.

J-B-T *Products*

Vibrating Reed Frequency Meters . . . Pyrometers . . . Potentiometer-Pyrometers . . . Resistance Thermometers . . . Appliance Temperature Testers . . . Thermocouples and Accessories . . . Reed Tachometers . . . Galvanometers . . . Selector Switches . . . Gas Pilot Safety Switches . . . and other Instruments and Testers.

J-B-T INSTRUMENTS, INC.
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PYROMETER CONTROLLERS

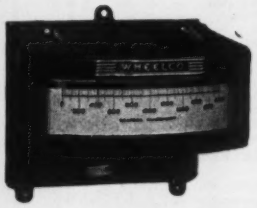
Brown Indicating Millivoltmeter Pyrometer Controllers meet the requirements of many temperature controller applications where a temperature record is not essential and cost is an important factor. Operating on the simple millivoltmeter principle, requiring neither batteries nor standard cells, they indicate the temperature on a direct reading 6" scale. Rugged and dependable, they are well suited for industrial applications where simplicity and ruggedness are of greater importance than extreme accuracy.

Dependable control is insured by glass-enclosed mercury switches which always provide perfect contacts—free from the effects of dirt and corrosive atmospheres. A variety of switching actions are available to suit individual process requirements. A thermocouple burn-out feature is available.

Send for catalog #10-1. Also see ElectroniK Pyrometers in the Potentiometer Section. THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

BROWN PYROMETERS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS

Temperature Measuring Instruments



Wheelco Precision Temperature Measuring Instruments include:

INDICATING PYROMETERS
PORTABLE PYROMETERS
PORTABLE POTENTIOMETERS
RESISTANCE THERMOMETERS, ETC.

Write for complete data on these instruments, today.

Wheelco Instruments Company
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PYROMETERS

Bristol's line of pyrometers includes potentiometer, millivoltmeter, thermocouple and radiation types for temperatures up to 3600°F.; automatic controllers, recorders and indicators; electronic pyrometer controllers. For complete details, including advantages of Bristol's Pyrometers and Pyrometer accessories, write for Bulletins PI200, PB1226, PB1217, PB-1213, and PI202. The Bristol Co., 113 Bristol Road, Waterbury 91, Conn.

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HAND PYROMETERS

For making quick, accurate temperature determinations—surface temperatures of welds, heated rollers, forgings, ovens, hot plates, furnace walls—for general checking in furnaces, lead and salt pots, galvanizing tanks, core ovens, type metal.

Made of sturdy cast aluminum and brass. Medium resistance, fast acting indicator with Alnico V magnet. Direct reading dial starts at 50° F. No adjustments necessary. Always ready for use. Uses most types of thermocouples. Four models. Now in stock.

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Ask also about Xactemp Pyrometers for molten non-ferrous metals

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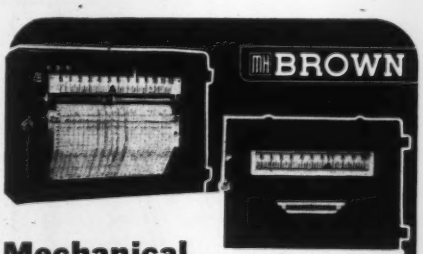


Mechanical POTENTIOMETERS

The Brown Mechanical Potentiometer is an acknowledged standard of accuracy and dependability throughout industry for controlling, recording, and indicating temperatures from —300 to 3200°F.

Models are available to record from 1 to 16 different temperatures on a wide variety of charts. Both charts and scales are 12" wide with a calibrated width of 11".

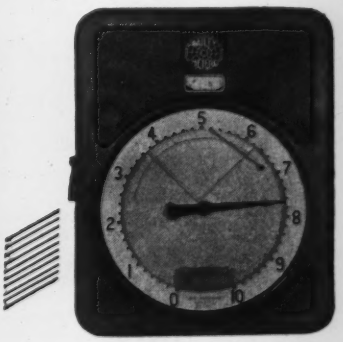
Both the slide wire and galvanometer are totally enclosed providing complete protection against dirt and dust.

CONTROL: Furnished in many control forms to meet requirements of industry. Contact controllers utilize glass-enclosed mercury switches; proportioning controllers employ an internal resistor.

Send for catalog No. 1105. Also see ElectroniK Pyrometers in Potentiometer Section.

THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

BROWN PYROMETERS
AND
MINNEAPOLIS HONEYWELL CONTROL SYSTEMS



BAILEY
Electronic Pyrometer

● This indicating, recording, and controlling BAILEY PYROTRON is a self balancing potentiometer which records one or two temperatures continuously on a 12-inch diameter chart and indicates on a 29-inch bold scale. It may be furnished with air-operated, electric, or electronic control.

A thermocouple or radiation unit is the temperature sensitive element.

Minimum maintenance is insured by elimination of galvanometers, millivolt meters, and continuously moving or vibrating mechanisms. A reversible electric motor under electronic control, balances the potentiometer network and drives the indicating, recording and controlling features.

Bailey Pyrotron Recorder-Controllers are made up of interchangeable assemblies, standardized so that only a few spare parts need be carried in stock to provide replacements for many instruments. Ask for Bulletin 232.

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Bailey Meter Company Ltd., Montreal, Canada

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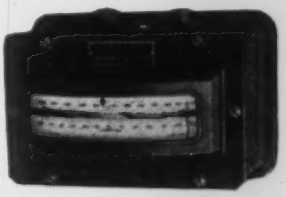
INDICATOR PYROMETER

A PRODUCT OF 40 YEARS OF RESEARCH



Model W-1
Switchboard Indicator

Unskilled help may handle this direct-deflection instrument, which needs no manual adjustment. Designed for numerous ranges of temperature, both F. and C.

Write for descriptive Bulletin 400

Charles Engelhard, Inc.
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Because they are made in various models; used with various temperature detectors; and for either pneumatic or electric control; Micromax and Speedomax Pyrometers and L&N Optical Pyrometers offer a comprehensive choice from which equipment can be selected to meet practically any temperature control-problem in any industry. Catalogs on request.

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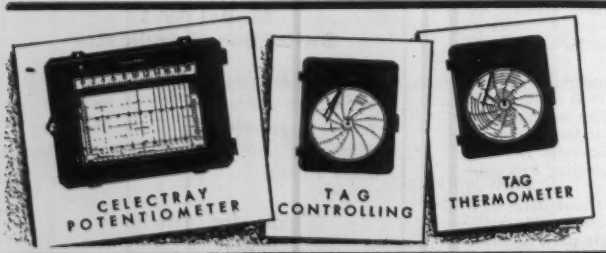

TAG RECORDERS

There is an instrument included in this group that is designed to record all temperatures from minus 200° C. up, and all industrial pressures.

Ask for catalogs . . . they graphically suggest the usefulness of Celectray Recording Potentiometer Pyrometer, TAG Recording Thermometer and Recording Pressure Gages for service and economy in your plant and laboratory.

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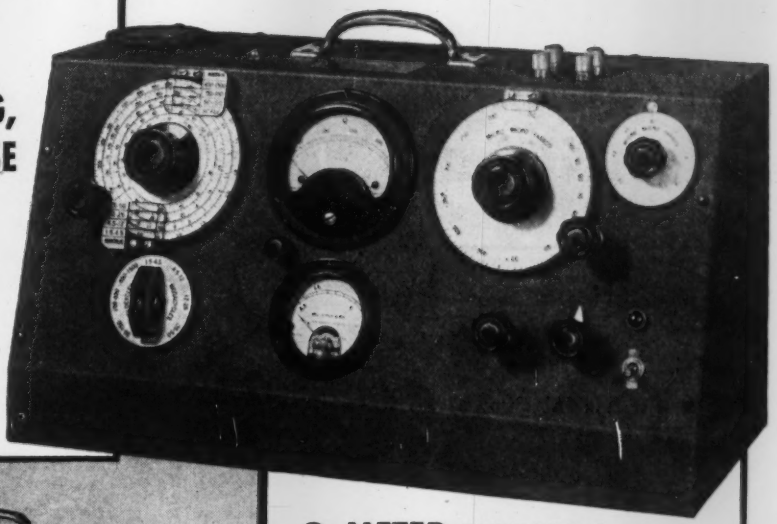
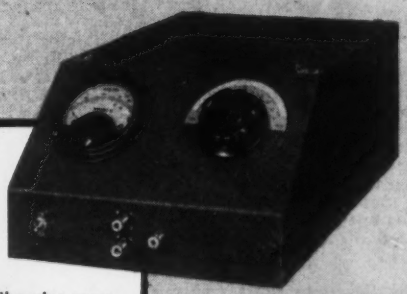


Q-METER *TYPE 160-A*

FREQUENCY RANGE: 50 kc to 75 mc (±1%, 50 kc—50 mc; ±3%, 50 mc—75 mc). May be extended down to 1 kc with external accessory oscillator.
RANGE OF Q MEASUREMENTS, COILS: 50—625.
ACCURACY OF Q MEASUREMENT: In general, ±5%.
RANGE OF Q TUNING CAPACITOR: Main Section, 30—450 mmf. (±1% or ±1 mmf., whichever is greater). Vernier Section, plus 3, zero, minus 3 mmf. (±0.1 mmf).

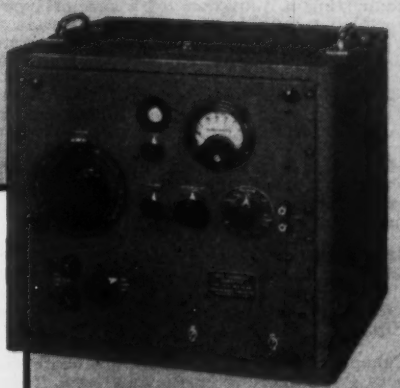
Q-METER *TYPE 170-A*

FREQUENCY RANGE: 30 mc to 200 mc (±1%).
RANGE OF Q MEASUREMENT: 80—1200.
ACCURACY OF Q MEASUREMENT: In general, ±10%.
RANGE OF Q TUNING CAPACITOR: 11—60 mmf. (±1% or ±0.5 mmf., whichever is greater).



QX-CHECKER *TYPE 110-A*

FREQUENCY RANGE: 100 kc to 25 mc using accessory plug-in inductors. A calibration sheet is supplied with each inductor, accurate to within ±3%.
RANGE OF COIL CHECKS: Inductors having values between 10 microhenries and 10 millihenries may be checked against a standard to an accuracy of about ±0.2% provided the Q of the inductor is 100 or greater.
CAPACITANCE RANGE: Capacitance values between about 2—1000 mmf. may be checked against standard by direct substitution, with an accuracy of a few tenths of one mmf., provided Q of capacitors is high.



BEAT FREQUENCY GENERATOR *TYPE 140-A*

FREQUENCY RANGE: 20 cycles to 5 megacycles in two ranges: LOW RANGE: 20 to 30,000 cycles. HIGH RANGE: 30 kilocycles to 5 megacycles. Accuracy ±2 cycles up to 100 cycles, ±2% above 100 cycles.
OUTPUT POWER: One watt, available from a variety of output impedances.
ATTENUATOR: 5 steps; X1.0, X0.1, X.01, X.001, X.0001.
DISTORTION: 3% or less.

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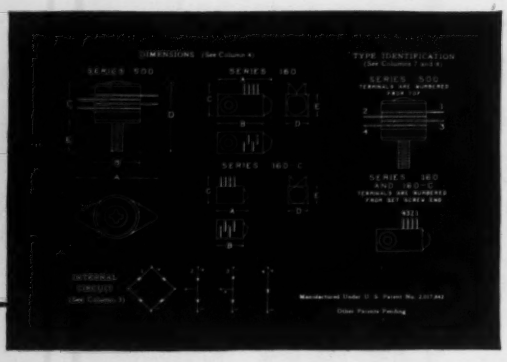
BEAT FREQUENCY GENERATOR
AND OTHER DIRECT READING TEST INSTRUMENTS

BOONTON RADIO *Corporation*

BOONTON, NEW JERSEY, U.S.A.

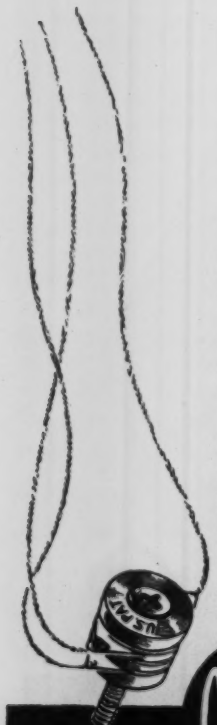
Conant Instrument Rectifiers



SPECIFICATIONS (STANDARD TYPES)

Col. 1	2	3	4					5	6	7	8				9						10
															PEAK ELECTRICAL RATINGS						
		Internal	Dimensions (inches)					Mounting Screw	Weight	No. of Terminals	Color, Terminal Number				Instantaneous		Intermittent		Continuous		*List
Type	Series	Circuit	A	B	C	D	E	Size	(Grams)		1	2	3	4	Volts	Mils	Volts	Mils	Volts	Mils	Price
M	500	1	.890	.500	.485	.800	.328	6-32	13.012	4	red	no	blk	no	30	100	20	60	10	30	$3.50
HS	500	2	.890	.500	.445	.800	.360	6-32	9.158	3	red	no	blk	—	15	100	10	60	5	30	2.70
T	500	3	.890	.500	.445	.800	.360	6-32	9.158	3	no	red	no	—	30	100	20	60	10	30	2.70
H	500	4	.890	.500	.400	.800	.392	6-32	7.730	2	red	no	—	—	15	100	10	60	5	30	1.50
B	160	1	.595	.485	.375	.250	.250	2-56	3.400	4	red	no	blk	no	30	15	20	10	10	5	3.50
BHS	160	2	.625	.550	.375	.250	.250	2-56	2.880	3	red	no	blk	—	15	15	10	10	5	5	2.70
BT	160	3	.625	.550	.375	.250	.250	2-56	2.880	3	no	red	no	—	30	15	20	10	10	5	2.70
BH	160	4	.625	.550	.375	.250	.250	2-56	2.700	2	red	no	—	—	15	15	10	10	5	5	1.50
B-C	160-C	1	.345	.297	.310	.220	.200	none	1.743	4	red	no	blk	no	30	15	20	10	10	5	3.50
BHS-C	160-C	2	.345	.297	.310	.220	.200	none	1.385	3	red	no	blk	—	15	15	10	10	5	5	2.70
BT-C	160-C	3	.345	.297	.310	.220	.200	none	1.385	3	no	red	no	—	30	15	20	10	10	5	2.70
BH-C	160-C	4	.345	.297	.310	.220	.200	none	1.293	2	red	no	—	—	15	15	10	10	5	5	1.50

Over ninety per cent of all rectifier requirements are served by 12 types—4 basic assemblies in 3 series. These 3 series are the three primary units of Conant rectifiers. Special types, however, can be developed as needed, and you'll find Conant ready to cooperate.



SERIES 500 UNITS are for general applications requiring greater output current for meters, relays or other apparatus requiring more than 1 milliampere. Recommended for all such applications at commercial and the lower audio frequencies. Will also operate up to 50,000 c.p.s. in special applications wherein accuracy of readings is not essential.

SERIES 160 and 160-C are for applications requiring good frequency response over the entire commercial and audio range and especially when the meter, relay or other apparatus requires less than 1 milliampere for operation. In some special applications these units may be operated at frequencies up to 15,000,000 c.p.s. with special circuit treatment.

SPECIAL TYPES are available in both series 500 and 160-C. When requesting a quotation on a special type include a sketch of the rectifier required or a circuit diagram showing source and frequency of the input voltage, resistance and kind of load, required load current and the ambient temperatures.

SERIES 500 Disc diameter .500 inch. Area each disc .15 square inch. Furnished with 3" braided, tinned copper leads. Finished in clear lacquer. Nickel plated end plates.

SERIES 160 Disc diameter .160 inch. Area each disc .02 square inch. Furnished with 3" stranded, tinned double silk covered copper leads. Nickel plated case. Assembly sealed with specially developed moisture proof compound.

SERIES 160-C Disc diameter .160 inch. Disc area, lead wire and length and moisture proof seal are identical with Series 160. Dimensions of the nickel plated case have been reduced to the most compact size. These units may be mounted in a standard midget fuse clip.

Conant Instrument Rectifiers are available from leading radio jobbers everywhere—consult your local jobber.

CONANT *Instrument Rectifiers*

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518 City Bank Bldg., Kansas City 8, Mo.
1212 Camp St., Dallas 2, Texas
378 Boulevard N. E., Atlanta, Ga.
4018 Greer Ave., St. Louis, Mo.
1526 Ivy St., Denver, Colo.
4214 Country Club Dr., Long Beach 7, Cal.
Export Div., 75 West St., New York 6, N. Y.
50 Yarmouth Rd., Toronto, Canada

REACTANCE METERS
Andrew, Victor J.
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Electro Products Lab.
Freed Transformer
General Radio Co.
Premier Crystal Labs.
RCA Manufacturing
Rubicon Co.
Sensitive Research Inst.

REACTIVE VOLT-AMPERE METERS, see Volt-ampere Meters, Reactive

READING LENSES, Thermometer & Burette (See Lenses, Reading)

RECORDERS (See object of measurement and control)

RECTIFIERS, Dry Disc
Am. Automatic Electric
American Radio Co.
Benwood Linze Co.
Bircher Corp.
Bradley Labs.
Cole Instrument
Conant Electrical Lab.
Control Corp.
Dearborn Scientific
Elec. Facilities, Inc.
Federal Telegraph Co.
General Elec. Co.
Mallory & Co.
Mellaphone Corp.
Raytheon Mfg. Co.
Schauer Mach. Co.
Standard Elec. Time
United Transformer Corp.
Westinghouse Elec.

RECTIFIERS, Power
Airdesign, Inc.
Allis-Chalmers
Amer. Automatic Elec. (Max.—5 amps.)
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Amplifier Co.
Applied Research Labs.
Benwood Linze
Bircher Corp.
Bradley Labs.
Cutler-Hammer, Inc.
Dayton Acme Co.
Dietert Co.
Eclipse Aviation
Elec. Facilities, Inc.
Electro Products Labs.
Electronic Labs., Inc.
Electrons, Inc.
Electro-Tech Equip.
Federal Telegraph Co.
General Elec. Co.
Lewyt Metal Prod.
Mellaphone Corp.
Raytheon Mfg. Co.
RCA Manufacturing
Schauer Mach. Co.
Taco Engineering
United Transformer Corp.
Westinghouse Elec.

RECTIFIERS, Thermionic
American Automatic Elec.
American Radio Co.
Amplifier Co.
Andrew, Victor J.
Benwood Linze
Bertcher Corp.
Communication Meas. Lab.
Continental Elec. Co.
Dearborn Scientific
DuMont Labs., Inc., A.B.
Electro Products Labs.
Electrons, Inc.
Emby Products
Federal Telegraph Co.
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Hy-Ef Elec. Products
Mellaphone Corp.
Raytheon Mfg. Co.
RCA Manufacturing Co.
Taco Engineering
United Cinephone Corp.
United Transformer Corp.

REDUCING MOTIONS, ENGINE INDICATOR
Bacharach Indust. Inst.
Crosby Steam Gage Co.
Robertson, 3rd, J. L.
Trill Indicator Co.
Trimount Inst. Co.

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REFLECTOMETERS
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American Inst. Co.
Dearborn Scientific
Fish-Schurman Corp.
Higgins, Charles F.
Leeds & Northrup Co.
Pfaltz & Bauer
Photovolt Corp.

REFLECTORS, Aspherical
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Baird Associates
Bausch & Lomb Optical
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Geophysical Inst. Co.
Optron Laboratory
Perkin-Elmer Corp.
Zenith Optical

REFLECTORS, Concave
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Cadillac Glass Co.
Clark & Sons
Fecker, J. W.
(Cont'd)

REFLECTORS, Concave (Cont'd)
Fish-Schurman Co.
Fuess, Inc.
Geophysical Inst. Co.
Optron Laboratory
Perkin-Elmer Corp.
Tinsley Labs.
Zenith Optical

REFLECTORS, First Surface
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Bray Optical Co.
Cadillac Glass Co.
Clark & Sons
Crystal Research Labs.
Dearborn Scientific
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Laboratory Specialties
Optron Laboratory
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Zenith Optical

REFLECTORS, Heat Resisting
Am. Telescope Labs.
Bausch & Lomb Optical
Cadillac Glass Co.
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Optron Laboratory
Perkin-Elmer Corp.
Zenith Optical

REFLECTORS, Parabolic
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Cadillac Glass Co.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Fuess, Inc.
Optron Laboratory
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Weber Brass Metal Works
Zenith Optical

REFLECTORS, Spherical
Am. Telescope Labs.
Baird Associates
Bausch & Lomb Optical
Fecker, J. W.
Fuess, Inc.
Fish-Schurman Co.
Geophysical Inst. Co.
Optron Laboratory
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Zenith Optical

REFLECTORS Stellite
Acme Industrial
American Telescope Labs.
Bausch & Lomb Optical
Geophysical Inst. Co.
Kollmorgen Optical Co.
Optron Laboratory
Perkin-Elmer Corp.
Zenith Optical

REFRACTOMETERS
Akatos, Inc.
American Optical
Bausch & Lomb Optical
Central Scientific Co.
Dearborn Scientific
Fish-Schurman Corp.
Fuess, Inc.
Gaertner Scientific
Jarrell-Ash Co.
Photovolt Corp.
Precision Scientific
Zeiss, Inc., Carl

REFRACTORY TUBES
Coors Porcelain Co.
Norton Co.

REGULATORS, AUTOMATIC (See Controls, Automatic; and object of measurement and control)

REGULATORS, AUTOMATIC, Air
Acme Regulator Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Automatic Temp. Control
Bailey Meter Co.
Bastian-Blessing Co.
Belfield Co.
Boekel & Co.
Boylston Co.
Bristol Co.
Brooke Eng. Co.
Brown Corp., W. R.
Brown Inst. Co.
Cash Co.
Connelly Iron Sponge
Cutler-Hammer, Inc.
Davis Reg. Co.
D'Este Division
Detroit Lubricator
Fisher Governor Co.
Fischer & Porter
Foster Engg. Co.
Foxboro Co.
Friez & Sons
Fulton Sylphon Co.
General Controls
General Elec. Co.
Hagan Corp.
Hoke, Inc.
Johnson Service Co.
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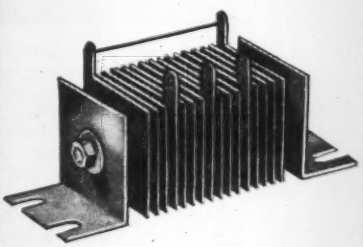
THE BRADLEY LINE

SELENIUM RECTIFIERS



Bradley selenium rectifiers give good efficiency and stability for medium voltage power applications at D.C. ratings up to 24 volts and at current ratings up to 5 amperes per plate. Ratipgs are for continuous operation in naturally circulating air at 35°C. ambient.

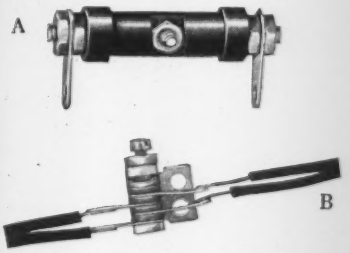
The current density of Bradley selenium rectifiers is conservatively listed at 0.333 amperes per square inch of plate. For power applications, square plate designs allow a maximum ratio of rating to space factor.

In high voltage electronics uses they are rated up to 37 volts peak inverse per plate. Current ratings as low as 500 microamperes are available. Special designs can be supplied for high frequency applications at even lower current ratings.

Bradley engineers will gladly assist you in any rectification problem involving instruments, electronic devices or power applications. Let them specify the proper selenium rectifier for your circuit, or design and produce a special unit for you.

● Above, Model Se-11U20-F9. Full-wave rectifier rated at 110 volts A.C., 80 volts D.C., and 1.15 amperes D.C.

COPPER OXIDE RECTIFIERS



"Coprox" rectifiers by Bradley feature gold-coated positive contact pellets to combat aging. Specially designed terminals and presoldering of lead wires prevent overheating during assembly.

High leakage resistance, low forward resistance make for efficient operation. To insure perfect sealing, standard units are sealed with waterproof lacquer and critical application units are potted in wax.

All ratings of Bradley rectifiers are conservative. Highly adaptable mountings provide a wide variety of installations that will stand up longer in service.

Let Bradley's application experience help you solve circuit design problems. Bradley engineers are leaders in the development and production of special rectifiers for special jobs.

● Above, A Coprox Model CX-1C2B1, a center tap, full-wave rectifier. Completely enclosed in Bakelite, low capacitance. Rectifies high frequency current. Conservatively rated up to 4.5 volts A.C., 3.0 volts D.C., 500 microamperes D.C.

● Above, B Coprox Model CX-2E4F2, a full-wave rectifier rated up to 4.5 volts A.C., 3.0 volts D.C., 5 milliamperes D.C.

PHOTO ELECTRIC CELLS

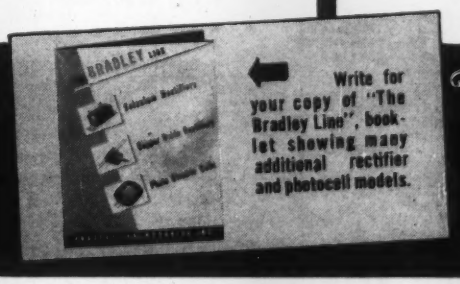
Bradley's Luxtron photocells efficiently convert light into electric energy sufficient to operate meters and meter relays without costly amplifiers. Lightweight, rugged and true to rating, they give long life under the most strenuous operating conditions.

Luxtron photocells are, so far as we have been able to determine, the very finest on the market although priced with inferior grades.

Shapes of Luxtron photocells vary from circles to squares, with every in-between shape desired. In size they range from the diminutive to the largest sizes required.

For precision control of light into electric energy, specify Luxtron photocells. Write Bradley today for samples and engineering assistance on any photocell problem you have in mind.

● Above, the pigtail contact model shown here is only one of a series of standard mountings. Others include housed models with plug-in contacts, tube socket and nut-and-bolt types.



Write for your copy of "The Bradley Line", booklet showing many additional rectifier and photocell models.

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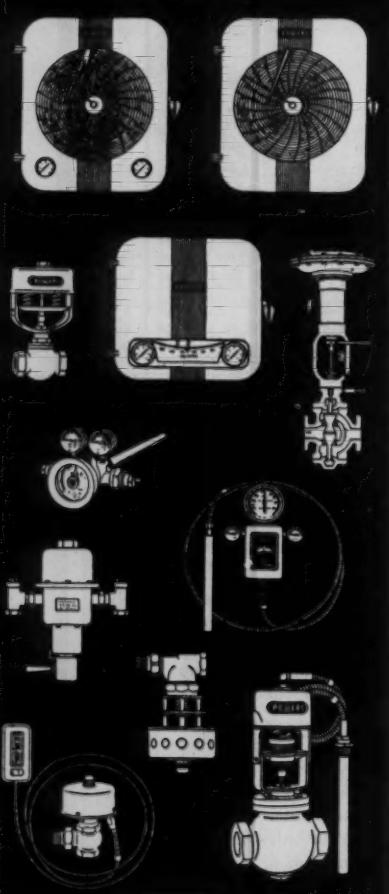
TEMPERATURE and HUMIDITY CONTROL



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Lammert & Mann Co.
Leslie Co.
Linde Air Products Co.
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Mason Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Moore Products
National Airoil Burner
Natural Gas Equipment
Northern Equip. Co.
Parks-Cramer Co.
Partlow Corp.
Payne Furnace & Supply
Penn Electric Switch Co.
Pgh. Equitable Meter
Powers Regulator Co.
Preferred Utilities Mfg.
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Ruggles-Klingemann
Schade Valve Mfg.
Selas Co.
Shallcross Controls
Sprague Meter Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
United Cinephone Corp.
Valverde Labs.
Vaughn-G.E. Witt Co.
Victor Equipment Co.
Watts Regulator Co.
White-Rodgers Electric
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Atmospheric

American Meter Co.
Cash Co.
D'Este Division
Foxboro Co.
General Controls
Mason-Neilan Regulator
Parks-Cramer Co.
Powers Regulator Co.
Robertshaw Thermostat
Taco Engineering

REGULATORS, AUTOMATIC, Boiler

A-Jacks Automatic
Askania Regulator Co.
Bailey Meter Co.
Brooke Eng. Co.
Brown Inst. Co.
Campbell Co., J. A.
Cash Co.
Connelly Iron Sponge
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
General Controls
General Regulator Corp.
Hagan Corp.
Hays Corp.
Hanlon-Waters, Inc.
Henszey Co.
Leeds & Northrup
Lumenite Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercon Regulator
Minneapolis-Honeywell
National Brass Co.
Natural Gas Equipment
Penn Electric Switch
Perfex Corp.
Republic Flow Meters
Robertshaw Thermostat
Ruggles-Klingemann
Shallcross Controls
Taco Engineering
Tagliabue Div.
Watts Regulator Co.
White Rodgers Elec.
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Compressed Gas

American Meter Co.
Askania Regulator Co.
Bailey Meter Co.
Bastian-Blessing
Bristol Co.
Brooke Eng. Co.
Brown Inst. Co.
Cash Co.
D'Este Division
Electrimatic Corp.
Fisher Governor Co.
Foxboro Co.
Frick Co.
General Controls
Hanlon-Waters, Inc.
Hoke, Inc.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Moore Products
Natural Gas Equipment
Pgh. Equitable Meter
Republic Flow Meters
Reynolds Gas Regulator
Robertshaw Thermostat
Schade Valve Mfg. Co.
Shallcross Controls
Taco Engineering
Tagliabue Div.
Victor Equipment Co.

REGULATORS, AUTOMATIC, Condensation (See Controllers, Automatic, Condensation)

REGULATORS, AUTOMATIC, Consistency (Paper & Pulp) (See Controllers, Automatic, Consistency)

REGULATORS, AUTOMATIC, Current

Abrams Instrument
American Radio Co.
Amperite Corp.
Amplifier Co.
Askania Regulator Co.
Automatic Temp. Control
Beck Bros.
Betts & Betts
Burlington Inst. Corp.
Cook Electric
Cutler-Hammer, Inc.
DoAll Co.
Eclipse-Pioneer Div.
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General Elec. Co.
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Rowe Radio Research
Sola Electric Co.
Sorensen & Co.
Standard Arcturus
Thordarson Elec. Mfg.
United Transformer
Westinghouse Elec.
Wheelco Instruments

REGULATORS, AUTOMATIC, Damper (See Controllers, Automatic, Damper)

REGULATORS, AUTOMATIC, District (See Governors, District)

REGULATORS, AUTOMATIC, Draft (See Controllers, Automatic, Draft)

REGULATORS, AUTOMATIC, Drying Chamber

Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Bristol Co.
Foxboro Co.
Fulton-Sylphon Co.
General Controls
Powers Regulator Co.
Trerice Co.
United Cinephone Corp.
United Elec. Controls

REGULATORS, AUTOMATIC, Feed Water

Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Belfield Co.
Brown Inst. Co.
Campbell Co., J. A.
Cochrane Corp.
Davis Reg. Co.
Defender Automatic Reg.
General Controls
General Regulator Corp.
Hagan Corp.
Hammel-Dahl Co.
Hanlon-Waters, Inc.
Lumenite Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercon Regulator Co.
Minneapolis-Honeywell
Natural Gas Equipment
Northern Equip. Co.
Republic Flow Meters
Ruggles-Klingemann
Taco Engineering
Tagliabue Div.
Taylor Inst. Co.
Vaughn-G. E. Witt Co.
Warrick Co.
Watts Regulator Co.
Wheelco Instruments
Wilgus Mfg. Co.
Williams Gauge Co.

REGULATORS, AUTOMATIC, Flow (See Controllers, Automatic, Flow)

REGULATORS, AUTOMATIC, Flow Proportioning (See Controllers, Automatic, Flow Proportioning)

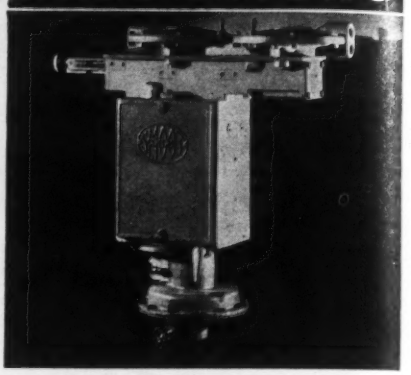
REGULATORS, AUTOMATIC, Fluid Proportioning (See Controllers, Automatic, Fluid Proportioning)

REGULATORS, AUTOMATIC, Frequency

Allis-Chalmers
American Radio Co.
Burlington Inst. Corp.
General Controls
General Elec. Co.
Kellogg Switchboard
Leeds & Northrup
Pitometer Log Corp.
Warren Telechron Co.
Westinghouse Elec.
Wheelco Inst. Co.

REGULATORS, AUTOMATIC, Furnace (See Controllers, Automatic, Furnace)

REGULATORS



Republic-Smoot regulators are supplied for the automatic control of pressure, rate of flow, speed of rotation, level of a liquid or the proportioning of two pressures, flows, etc., in a fixed ratio by mechanically operating a valve, damper, rheostat or various types of variable speed transmissions.

Republic-Smoot regulators may be either oil or air operated. Their extreme flexibility in application and the degree to which they meet the four requirements of sensitivity, power, speed and stability, had been responsible to a large degree for the outstanding success of Republic-Smoot control systems.

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Special Research Associate Professor of Civil Engineering, University of Illinois
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This is the history-making serial, "ELECTRIC GAGING METHODS" which ran in *Instruments* in 1944-1946 plus 50 pages of new material.

Typical of the comments received while this book ran as a serial, are the following:

"I have been following with considerable interest your series of articles in *Instruments* on the subject of Electric Gaging Methods; and I appreciate the thoroughness with which the subject is being treated."

"We are sure that your articles in *Instruments* will be widely read, for it is a subject certainly in need of the correlation you are giving it."

"In all your articles I have admired with how much care you always have studied earlier publications on the subject, not only in this country but in Europe . . . Some day, I hope, I will see your articles in the form of a book."

"I have just read, with great interest, the first installment of your 'Electric Gaging Methods' in the April *Instruments*. How true are Mr. Behar's remarks in the Editor's Preface regarding the need for an authoritative and comprehensive article such as you have undertaken."

"Your articles have developed into a far more extensive treatise than I had expected, and I am glad to find that you have done so exhaustive a job on the subject."

"I have been fortunate enough to come across your articles on 'Electric Gaging Methods' in *Instruments*. It seems to be just what I have been looking for."

"The undersigned has been reading your articles each month, and has found them to be of maximum interest. They are indeed an excellent course in electric gaging methods . . . We are looking forward to your future installments, and to obtaining an assembled book of all the chapters eventually."

"We have followed with interest your series of articles on 'Electric Gaging Methods' in recent issues of *Instruments*. We have made reproductions of these articles and have them in our files for reference as we feel that much valuable information is contained therein."

"The splendid paper entitled 'Electric Gaging Methods' which you are now presenting in *Instruments* has prompted me to write to you on behalf of the Society of Experimental Stress Analysis to inquire if you would be in a position to take part as an author in the forthcoming meeting . . ."

"These articles would be of great help to us in our scientific research work since they introduce some novel measurement techniques, and if there is anything you can do to help us obtain copies of this series of articles . . ."

(The writers of the foregoing comments are themselves among the most eminent engineers, industrial executives, and research scientists.)

TABLE OF CONTENTS

PART ONE: PRINCIPLES OF OPERATION. I, Introduction; II, General Principles; III, Gaging Methods Based On Variations of Capacitance; IV, Gaging Methods Based on Variations of Inductance; V, Gaging Methods Based On Variations of Resistance; VI, Photoelectric Gaging Methods; VII, Piezoelectric Gaging Methods; VIII, Thermoelectric, Acoustic, and Other Methods; IX, Bridge and Potentiometer Circuits: General Principles; X, Bridge Circuits; XI, Potentiometer Circuits; XII, Indicating and Detecting Instruments.

PART TWO: EQUIPMENT. XIII, Calibrating Devices; XIV, Calibration-checking Circuits; XV, Oscillographs; XVI, Power Supplies; XVII, Amplifiers and Computing Devices; XVIII, Self-contained Gaging Systems.

APPENDIX—Recent Developments; BIBLIOGRAPHY (classified and graded); INDEX of References; INDEX.

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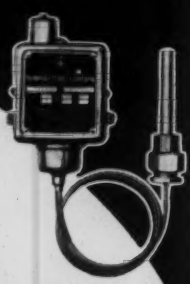
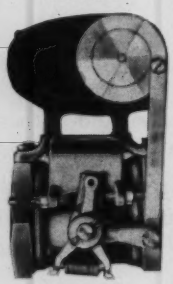
Non-Indicating Type for Temperature, Pressure, Humidity, etc.

Pressure Controller



Non-Indicating Temperature Controller

Motorized Globe Valve



Motorized Globe and Butterfly Valve

In hundreds of applications throughout Industry, these inexpensive non-indicating regulators are doing an efficient job of controlling process variables. As products of Minneapolis-Honeywell, they are backed by 200 years of cumulative experience devoted entirely to controls.

Supplied as either electric or pneumatic controllers, M-H Regulators can be used to operate most sizes and types of control valves.

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Remote bulb or direct immersion types. For temperatures up to 700°F.

PRESSURE CONTROLLERS

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REGULATORS, AUTOMATIC, Gas (See Regulators, Automatic, Air)

REGULATORS, AUTOMATIC, Humidity (See Controllers, Automatic, Humidity)

REGULATORS, AUTOMATIC, Liquid Level (See Controllers, Automatic, Liquid Level)

REGULATORS, AUTOMATIC, Load
Allis-Chalmers Mfg. Co.
Autom'c Valve Controller
Burlington Inst. Co.
Fisher-Pierce Co.
Foxboro Co.
General Controls
Hagan Corp.
Hays Corp.
Leeds & Northrup Co.
Leslie Co.
Robinette Co., W. C.
Taylor Inst. Cos.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Oil Feed
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Brown Inst. Co.
Cash Co.
D'Este Co.
Fisher Governor
Foster Engg. Co.
General Regulator Corp.
Hagan Corp.
Lammert & Mann Co.
Leslie Co.
Lumenite Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
National Airoil Burner
Republic Flow Meters
Spence Engineering Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
United Cinephone Corp.
Vaughn-G. E. Witt Co.
Wilgus Manufacturing

REGULATORS, AUTOMATIC, Phase
Allis-Chalmers
Clarke Inst. Corp.
General Controls
Kollsman Instrument
Westinghouse Elec.

REGULATORS, AUTOMATIC, Power Factor
Allis-Chalmers Mfg. Co.
General Controls
Leeds & Northrup Co.
Shallcross Controls
United Cinephone Corp.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Pressure (See Controllers, Automatic, Pressure)

REGULATORS, AUTOMATIC, Pump
Allen-Bradley Co.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Automatic Control
Automatic Temp. Control
Bailey Meter Co.
Beck Co.
Belfield Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Cash Co.
(Cont'd)

REGULATORS, AUTOMATIC, Pump (Cont'd)
Davis Reg. Co.
D'Este Division
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Fulton Syphon Co.
Furnas Electric Co.
General Regulator Corp.
Hagan Corp.
Hanlon-Waters, Inc.
Henszey Co.
Hydraulic Press Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Northern Equip. Co.
Penn Electric Switch
Republic Flow Meters
Robinette Co., W. C.
Water Level Controls Co.
Samsel Time Control
Schade Valve Mfg. Co.
Spence Engineering Co.
Tagliabue Div.
Vaughn-G. E. Witt Co.
Watts Regulator Co.
Wilgus Mfg. Co.

REGULATORS, AUTOMATIC, Refrigeration (See Controllers, Automatic, Refrigeration)

REGULATORS, AUTOMATIC, RKVA
Allis-Chalmers Mfg. Co.
Leeds & Northrup
Thordarson Elec. Mfg.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Safety Fuel Shut-Off (See Valves, Automatic, Safety Fuel

REGULATORS, AUTOMATIC, Steam Pressure (See Regulators, Automatic, Pressure)

REGULATORS, AUTOMATIC, Synchronizing
Allis-Chalmers Mfg. Co.
Burlington Inst. Co.
Control Corp.
Cutler-Hammer, Inc.
General Controls
Industrial Engr. Corp.
Magnetic Gauge Co.
Shallcross Controls
Westinghouse Elec.

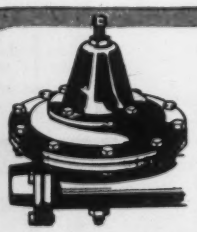
REGULATORS, AUTOMATIC, Temperature (See Controllers, Automatic, Temperature)

REGULATORS, AUTOMATIC, Time (See Controllers, Automatic, Time)

REGULATORS, AUTOMATIC, Vacuum (See Controllers, Automatic, Vacuum)

REGULATORS, AUTOMATIC, Viscosity (See Controllers, Automatic, Viscosity)

REGULATORS, AUTOMATIC, Voltage
Allis-Chalmers
American Transformer
Amperite Corp.
Amplifier Co.
Askania Regulator Co.
Beck Co.
Burlington Inst. Corp.
Clarostat Mfg. Co.
(Cont'd)



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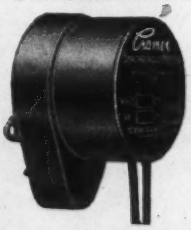

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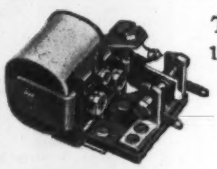
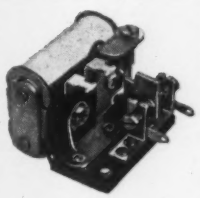


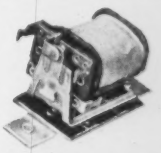
TYPE 4F
1⅜" x 1¾" x 1 5/32"
Weight: 2 3/16 oz.

Recommended for:
- Light Weight
- High Speed
- Moderately severe environment (temperature and vibration)
- Moderate Sensitivity
- Minimum input power 10 milliwatts
- Coil resistance up to 14,000 ohms.



TYPE 5F
1⅜" x 1⅜" x 1⅝"
Weight: 3½ oz.

Recommended for:
- Exceptionally severe environmental conditions
- Maximum Sensitivity
- Minimum input power 0.5 milliwatts
- Coil resistance up to 18,000 ohms.



TYPE 41F
1" x 1 7/32" x 2 3/16"
Weight: 2 5/16 oz.

Recommended for:
- Critical performance requirements at a low price in high volume applications. Features of other SIGMA Relays not needed in these applications have been omitted.
- Minimum input power 20 milliwatts
- Coil resistance up to 14,000 ohms.

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SIGMA AC RELAYS

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Series 41 AC Relays are of shaded coil construction and do not require rectifiers. They are unusually efficient and absolutely quiet. Coils are available for any voltage from 1 to 230 volts — minimum input of 0.1 volt amperes.

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Communication Meas. Lab.
Control Corp.
Eclipse Aviation
Electronic Prod. Co.
Federal Telegraph Co.
Ferris Inst. Corp.
Fredericks, George
General Elec. Co.
Harvey Radio Labs.
Ideal Commuto'r Dresser
International Resistance
Kellogg Switchboard
Miller Co., Bertrand F.
Polarad Electronics
Raytheon Mfg. Co.
Rowe Radio Research
Sola Electric Co.
Sherron Metallic
Taco Engineering
Thordarson Elec. Mfg.
United Cinephone Corp.
United Transformer Corp.
Ward Leonard Elec. Co.
Westinghouse Elec.
Wheelco Instruments

REGULATORS, AUTOMATIC, Water Pressure (See Regulators, Automatic, Pressure)

REGULATORS, AUTOMATIC, Welding, Gas
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Hoke, Inc.
Linde Air Products
Victor Equipment Co.

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Automatic Elec. Mfg.
Bailey Meter Co.
Beck Bros.
Belfield Co.
Brown Inst. Co.
Cutler-Hammer, Inc.
Fisher Governor
Hanlon-Waters, Inc.
Mason-Neilan Co.
McAlear Mfg. Co.
National Airoil Burner
National Elec. Controller
Pioneer Instrument
Schade Valve Mfg. Co.
Shallcross Controls
States Co.
Superior Electric Co.
Taco Engineering
Tagliabue Div.
United Transformer Corp.
(Cont'd)

REGULATORS, MANUAL (Cont'd)
Ward Leonard Elec. Co.
Westinghouse Elec.
Wheelco Instruments

RELAYS, Automatic
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American Inst. Co.
American Automatic Elec.
Amperite Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Beck Co.
Clare & Co.
Cook Electric Co.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eclipse Aviation
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hagan Corp.
H-B Elec. Co.
Industrial Eng. Corp.
Industrial Timer Corp.
Kellogg Switchboard
Kurman Electronics
Mercoid Corp.
Minneapolis-Honeywell
Monitor Controller Co.
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Potter & Brumfield
Roller-Smith Co.
Struthers-Dunn
Taco Engineering
Triplett Elec. Inst.
Ward Leonard Elec. Co.
Washington Glass Lab.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Capacity-Operated
Amer. Automatic Elec.
Automatic Elec. Mfg.
Automatic Temp. Control
Cook Electric
Electronic Lab.
General Controls
Kurman Electronics
Lustrol Co., Inc.
Potter & Brumfield
Taco Engineering

RELAYS, Circuit Control
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Automatic Elec.
American Inst. Co.
Amperite Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
(Cont'd)

RELAYS, Circuit Control (Cont'd)
Automatic Switch Co.
Automatic Temp. Control
Beck Co.
Brown Inst. Co.
Clare & Co.
Cook Electric Co.
Cutler-Hammer, Inc.
Edison Electrical Controls
Friez & Sons
General Controls
General Elec. Co.
Guardian Elec. Mfg. Co.
H-B Electric
Industrial Timer Corp.
Kellogg Switchboard
Kurman Electronics
Leach Relay Co.
Lumenite Elec. Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
Paragon Electric Co.
Perfex Corp.
Precision Scientific
Potter & Brumfield
Roller-Smith Co.
Samsel Time Control
Sigma Instruments, Inc.
Struthers-Dunn
Taco Engineering
Triplett Elec. Inst.
United Cinephone Corp.
Ward Leonard Elec. Co.
Western Electro-Mech.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Continuous Current
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Automatic Elec.
American Inst. Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Temp. Control
Clare & Co.
Cook Electric Co.
Cutler-Hammer, Inc.
Edison Electrical Controls
General Controls
General Elec. Co.
Guardian Elec. Mfg. Co
H-B Electric
Industrial Timer Corp.
Kellogg Switchboard
Kurman Electronics
Leach Relay Co.
Paragon Electric Co.
Potter & Brumfield
Sigma Instruments
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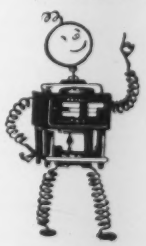

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Taco Engineering
Triplett Elec. Inst.
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Control
Allen-Bradley Co.
Advance Elec. & Relay Co.
Allied Control Co.
American Automatic Elec.
American Inst. Co.
Amperite Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Switch Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Beck Co.
Betts & Betts
Brown Inst. Co.
Clare & Co.
Control Corp.
Cook Electric Co.
Cutler-Hammer, Inc.
Edison Electrical Controls
Fisher-Pierce Co.
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hagan Corp.
H-B Electric
Industrial Eng. Corp.
Industrial Timer Corp.
Kellogg Switchboard
Kurman Electronics
Leach Relay Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
National Time & Signal
Perfex Corp.
Potter & Brumfield
Precision Therm.
Robinette Co., W. C.
Roller-Smith Co.
Samsel Time Control
Sigma Instruments
Struthers-Dunn
Taco Engineering
Triplett Elec. Inst.
United Cinephone Corp.
Ward Leonard Elec. Co.
Western Electro-Mech.
Westinghouse Elec.
Weston Elec. Inst. Corp.
White Rodgers Elec.

RELAYS, Demand Totalizing
Amer. Automatic Elec.
Autocall Co.
General Elec. Co.
Hagan Corp.
United Cinephone Corp.
Westinghouse Elec.

RELAYS, Electromagnetic
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Automatic Elec.
American Inst. Co.
Amperite Co.
Autocall Co.
Automatic Elec. Sales
Automatic Switch Co.
Bender Warrick
Birtcher Corp.
Bunnell & Co.
Control Corp.
Cook Electric Co.
Clare & Co.
Cutler-Hammer, Inc.
Eby, Inc.
Friez & Sons
General Elec. Co.
G-M Labs.
Gorrell & Gorrell
Guardian Elec. Mfg. Co.
Haydon Mfg. Co.
H-B Electric
Industrial Eng. Corp.
Kellogg Switchboard
Kurman Electric Co.
Leach Relay Co.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Monitor Controller Co.
Muter Co.
National Time & Signal
Penn Electric Switch Co.
Perfex Corp.
Phila. Thermometer Co.
Precision Scientific
Precision Therm. & Inst.
Potter & Brumfield
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Struthers-Dunn
Taco Engineering
Triplett Elec. Inst.
United Cinephone Corp.
Ward Leonard Elec. Co.
Warrick Co.
Western Electro-Mech.
Westinghouse Elec.
Weston Elec. Inst. Corp.
White-Rodgers Electric
Zenith Electric Co.

RELAYS, Electronic
Advance Elec. & Relay Co.
American Inst. Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Beck Co.
Bell & Howell
Cardwell Mfg. Corp.
Central Scientific
Clare & Co., C. P.
Coleman Electric
Cook Electric
Cramer Co., Inc.
Cutler-Hammer, Inc.
Davis & Co., Inc., Dean
Echo Electrical

(Cont'd)

RELAYS, Electronic (Cont'd)
Electronic Engineers
Electro-Medical Lab.
Ess Instrument
Fisher-Pierce Co.
General Elec. Co.
Guardian Elec. Mfg.
Harvey Radio Labs.
Kurman Electronics
Photobell Corp.
Potter & Brumfield
Robinette Co., W. C.
Sigma Instruments
Taco Engineering
Televiso Products
Thordarson Elec. Mfg.
United Cinephone

RELAYS, Frequency
Allied Control Co.
Amer. Automatic Elec.
Autocall Co.
Automatic Switch Co.
Clare & Co., C. P.
Control Corp.
Cook Electric
Cutler-Hammer, Inc.
Esterline-Angus Co.
General Elec. Co.
Hickok Electrical Inst.
Kurman Electronics
Potter & Brumfield
Sigma Instruments
Stevens-Arnold Co.
Taco Engineering
United Cinephone Corp.
Wallace & Tiernan
Ward Leonard Electric Co.
Westinghouse Elec.

RELAYS, Galvanometer
Amer. Automatic Elec.
Autocall Co.
Automatic Temp. Control
Cole Instrument
Eby, Inc., Hugh H.
Edison Electrical Controls
G-M Laboratories, Inc.
Potter & Brumfield
Roller-Smith Co.
Rubicon Co.
Taco Engineering
Tagliabue Div.

RELAYS, Heavy Duty
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Automatic Elec.
American Inst. Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Switch Co.
Automatic Temp. Control
Cook Electric
Cutler-Hammer, Inc.
General Elec. Co.
H-B Electric
Kurman Electronics
Miller Co., Bertrand F.
Monitor Controller Co.
Penn Electric Switch
Philadelphia Thermometer
Potter & Brumfield
Ward Leonard Elec. Co.
Westinghouse Elec.
Zenith Electric Co.

RELAYS, Instrument Controlled
Allied Control Co.
American Automatic Elec.
American Inst. Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Beck Co.
Brown Inst. Co.
Carter Radio Div.
Clare & Co.
Cole Instrument
Cook Electric Co.
Cramer & Co., Inc.
Friez & Sons
General Elec. Co.
Guardian Elec. Mfg. Co.
H-B Electric
Kurman Electronics
Minneapolis-Honeywell
Perfex Corp.
Phila. Thermometer Co.
Potter & Brumfield
Precision Scientific
Precision Therm.
Roller-Smith Co.
Sigma Instruments
Struthers-Dunn
Taco Engineering
Tagliabue Div.
Triplett Electrical Inst.
United Cinephone Corp.
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Light Sensitive (See Photoelectric below)

RELAYS, Magnetic (See Relays, Electromagnetic)

RELAYS, Mercury
American Automatic Elec.
American Inst. Co.
Autocall Co
Automatic Temp. Control
Continental Elec. Co.
Guardian Electric
H-B Elec. Co., Inc.
Kurman Electronics
Precision Scientific
Precision Therm.
Taco Engineering
Weston Elec. Inst. Corp.

RELAYS, Mercury Tube
Amer. Automatic Elec.
American Inst. Co.
Autocall Co.

(Cont'd)

RELAYS, Mercury Tube (Cont'd)
Automatic Elec. Sales
Automatic Temp. Control
Brown Inst. Co.
Clare & Co.
Struthers-Dunn
General Controls Co.
G-M Labs.
Guardian Elec. Mfg. Co.
Kellogg Switchboard
Minneapolis-Honeywell
Phila. Thermometer
Precision Scientific
Precision Therm.
Taco Engineering
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Motor Driven Time Delay
Advance Elec. & Relay Co.
American Inst. Co.
Automatic Elec. Mfg.
Barber-Colman
Betts & Betts
Controls, Inc.
Cramer Co., Inc.
Struthers-Dunn
Friez & Sons
General Controls
General Elec. Co.
Haydon Mfg. Co.
Industrial Eng. Corp.
Industrial Timer
Kurman Electronics
Monitor Controller Co.
Paragon Electric Co.
Taco Engineering
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Zenith Electric Co.

RELAYS, Movable Coil A.C.
Esterline-Angus Co.
General Elec. Co.
Kurman Electronics
Roller-Smith Co.
Taco Engineering
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Overload
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
Amer. Automatic Elec.
Autocall Co.
Automatic Elec. Mfg.
Automatic Switch Co.
Automatic Temp. Control
Bunnell & Co.
Burlington Inst. Corp.
Cook Electric
Cutler-Hammer, Inc.
Edison, Instrument Div.
General Elec. Co.
Guardian Elec. Mfg. Co.
Kurman Electronics
Leach Relay Co.
Penn Electric Switch
Potter & Brumfield
Roller-Smith Co.
Sigma Instruments
Standard Elect. Prods.
Struthers-Dunn
Taco Engineering
Ward Leonard Elec. Co.
Westinghouse Elec.

RELAYS, Permanent Magnet Movable Coil
Bunnell & Co.
Cole Instrument
Electronics, Inc.
Esterline-Angus Co.
General Elec. Co.
Kurman Electronics
Roller-Smith Co.
Taco Engineering
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Photoelectric
Advance Elec. & Relay Co.
Allied Control Co.
American Inst. Co.
Eby, Inc.
Clare & Co.
Continental Elec. Co.
Cutler-Hammer, Inc.
Dickson Co.
Electronic Engineers
Electronic Lab.
Electronic Prod. Co.
Ess Instrument Co.
Fisher-Pierce Co.
General Controls Co.
General Elec. Co.
G-M Labs.
Kurman Electronics
Leach Relay Co.
Lumenite Elec. Co.
Photobell Corp.
Photoswitch, Inc.
Precision Therm.
Rehtron Corp.
Rubicon Co.
Sigma Instruments, Inc.
Taco Engineering
Tagliabue Div.
Triplett Elec. Inst.
United Cinephone Corp.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

RELAYS, Polarized
Allied Control Co.
American Automatic Elec.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Edison Electrical Controls
Kurman Electronics
L. A. B. Corp.

(Cont'd)

RELAYS, Polarized (Cont'd)
Miller Co., Bertrand F.
Precision Therm. & Inst.
Sigma Instruments
Stevens-Arnold Co.
Struthers-Dunn
Taco Engineering
Triplett Elec. Inst.
Utah Radio Prods.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Power
Advance Elec. & Relay Co.
Allied Control Co.
Amer. Automatic Elec. (Max. 10 Amps.)
American Inst. Co.
Automatic Elec. Mfg.
Automatic Switch Co.
Cutler-Hammer, Inc.
Esterline-Angus Co.
General Controls Co.
General Elec. Co.
Hagan Corp.
H-B Electric
Kurman Electronics
Potter & Brumfield
Robinette Co., W. C.
Roller-Smith Co.
Struthers-Dunn
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Power Factor
Cutler-Hammer, Inc.
Esterline-Angus Co.
Kurman Electronics
L. A. B. Corp.
Potter & Brumfield
Westinghouse Elec.

RELAYS, Resistance, D-c.
Advance Elec. & Relay Co.
Allied Control Co.
Autocall Co.
Automatic Electric Co.
Bunnell & Co.
Clare & Co., C. P.
Cole Instrument
Cook Electric Co.
Cutler-Hammer, Inc.
General Elec. Co.
Guardian Electric
Haydon Mfg. Co.
Kurman Electronics
Leach Relay Co.
Sigma Instruments
Struthers-Dunn
Taco Engineering
Ward Leonard Elec. Co.

RELAYS, Stepping
Allied Control Co.
Autocall Co.
Automatic Elec. Mfg.
Automatic Electric Sales
Clare & Co.
Cook Electric
General Elec. Co.
G-M Laboratories, Inc.
Guardian Electric
Kurman Electronics
Roller-Smith Co.
Struthers-Dunn
Taco Engineering
Westinghouse Elec.

RELAYS, Telephone Auxiliary Ringing
Advance Elec. & Relay Co.
Allied Control Co.
American Automatic Elec.
Autocall Co.
Automatic Elec. Sales
Clare & Co.
Cook Electric
Federal Telegraph Co.
Kurman Electronics
Kellogg Switchboard
Leach Relay Co.
Potter & Brumfield
Sigma Instruments
Struthers-Dunn
Western Electro-Mech.

RELAYS, Temperature
Autocall Co.
Automatic Temp. Control
Clare & Co., C. P.
Cole Instrument
Cook Electric Co.
Edison Electrical Controls
Friez & Sons
General Controls
General Elec. Co.
Gleason-Avery, Inc.
G-M Laboratories, Inc.
Guardian Electric
Kurman Electronics
Leach Relay Co.
Minneapolis-Honeywell
Photobell Corp.
Spencer Thermostat Co.
Struthers-Dunn
Taco Engineering
Tagliabue Div.
Triplett Elec. Inst.
United Cinephone Corp.
Westinghouse Elec.
Weston Electrical Inst.

RELAYS, Thermal Time Delay
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Automatic Elec.
Am. Gas Accumulator
American Inst. Co.
Amperite Corp.
Autocall Co.
Automatic Temp. Control
Betts & Betts
Clare & Co.
Cook Electric Co.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eagle Signal Corp.

(Cont'd)

RELAYS, Thermal Time Delay (Cont'd)
Echo Electrical
Edison Electrical Controls
Electronic Prod. Co.
Fisher-Pierce Co.
General Controls
General Elec. Co.
Guardian Elec. Mfg. Co.
Haydon Co.
Industrial Eng. Corp.
Industrial Timer Corp.
Kurman Electronics
Leach Relay Co.
Magnetic Gauge Co.
Meletron Corp.
Paragon Electric Co.
Partlow Corp.
Perfex Corp.
Photobell Corp.
Precision Therm.
Preferred Utilities Mfg.
Roller-Smith Co.
Sigma Instruments
Struthers-Dunn
Taco Engineering
Teleoptic Co.
Ulanet Co., Geo.
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.
Westinghouse Elec.
White-Rodgers Electric
Zenith Electric Co.

RELAYS, Time Delay (See Relays, Thermal Time Delay)

RELAYS, Transformer (Low Voltage)
Allen-Bradley Co.
Allied Control Co.
Automatic Electric
Barber-Colman
Eclipse Aviation
Friez & Sons
General Controls Co.
General Elec. Co.
Gleason-Avery, Inc.
Guardian Elec. Mfg. Co.
H-B Electric
Industrial Eng. Corp.
Kurman Electronics
Miller Co., Bertrand F.
Minneapolis-Honeywell
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Potter & Brumfield
Samsel Time Control
Sigma Instruments, Inc.
Struthers-Dunn
Taco Engineering
Thordarson Elec. Mfg.
Ward Leonard
Warrick Co.
Westinghouse Elec.
White-Rodgers Electric

RELAYS, Vacuum Contact
American Automatic Elec.
American Inst. Co.
Edison, Instrument Div.
General Elec. Co.
Kurman Electronics

RELAYS, Vacuum Tube
Allied Control Co.
American Inst. Co.
Amperite Co.
Automatic Elec.
Automatic Temp. Control
Continental Elec. Co.
Struthers-Dunn
Eby, Inc.
Electro-Medical Lab.
Electronic Prod. Co.
Fisher-Pierce Co.
General Controls Co.
General Elec. Co.
G-M Labs.
Harvey Radio Labs.
Kellogg Switchboard
Kurman Electronics
L. A. B. Corp.
Lumenite Elec. Co.
Metron Instrument
Photobell Corp.
Precision Therm.
Robinette Co., W. C.
Sargent & Co.
Sigma Instruments
Taco Engineering
Tagliabue Div.
United Cinephone Corp.
Wilson & Co.

RELAYS, Voltage
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
Amperite Co.
Autocall Co.
Automatic Elec.
Automatic Elec. Mfg.
Automatic Switch Co.
Barber-Colman
Clare & Co., C. P.
Cook Electric
Cutler-Hammer, Inc.
Dunn, Inc., Struthers
Eby, Inc., Hugh H.
Esterline-Angus Co.
Ferranti Electric, Inc.
General Controls
General Elec. Co.
Hart Manufacturing Co.
Hathaway Inst. Co.
Kurman Electric
Leach Relay Co.
Photobell Corp.
Potter & Brumfield
Reliance Instrument Co.
Roller-Smith Co.
Sigma Instruments
Taco Engineering
Triplett Electrical Inst.
Ward Leonard Electric Co.
Westinghouse Elec.
Weston Electrical Inst.

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THE MAGAZINE OF

Measurement and Control

will signalize the first Instrument Conference and Exhibit — to be held in Pittsburgh, September 16 through 20, 1946

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WHAT is this occasion? It is the first Conference and Exhibit devoted to instruments for measurement, testing, automatic control, metering, inspection, etc.—"lab and plant"—industrial and scientific—research and production. (These are the products which *Instruments* has promoted for eighteen years.)

WHERE? William Penn Hotel, Pittsburgh—the entire Seventeenth Floor (the scene of many famous conventions and expositions)—plus the "Pittsburgh Room" downstairs and other rooms for small gatherings.

WHO? The sponsoring organization is the Instrument Society of America, a federation of the local societies of instrument men all over the U.S. and including Canada. "Instrument men" are engineers and executives, production men and research men. Their titles range from "President and General Manager" to "Superintendent" and "instrument engineer" or "instrument man" but they all use devices for measurement, testing, control, etc.—and they buy or specify these products. **(They are the men whom *Instruments* has been serving for eighteen years.**

WHEN? From Monday, September 16 through Friday, September 20. The September issue of *Instruments* will be mailed on Saturday, September 7th so as to reach subscribers **before** they leave: they will take it with them, study it on trains and planes, and keep it as a guide.

HOW MANY? This issue will be read by the ten thousand regular subscribers—whether or not they visit the Show. Two thousand more copies will be distributed from the Instruments Publishing Company's booth to visiting non-subscribers. The total circulation of 12,000 will mean a readership of 30,000—perhaps 40,000—because no other publication does the job which *Instruments* does.

WHY? Why advertise in this special issue? In addition to above reasons, here are a few FACTS: **(1)** Numerous tests—such as percent of inquiries resulting in sales—have proved again and again that *Instruments* is the most effective medium—and the most economical—for instruments and all other products bought or specified by Instrument Men. **(2)** This special issue will not only contain a preview of the Conference events and an informative detailed list of exhibits, but will contain technical articles and numerous "shorts" of lasting value. The editors have been "designing" it for months. It will *live*! **(3)** Far-sighted advertisers, likewise, have been planning to utilize its PERMANANCE. **(4)** So relatively low are the rates (regular rates!) that the most hard-boiled space-buyers will say that this is indeed an exceptional opportunity.

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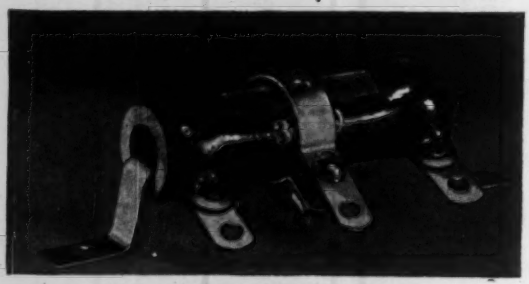

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Brooke Eng. Co.
Brown Inst. Co.
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Cardwell Mfg. Co.
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Control Corp.
Cutler-Hammer, Inc.
Davis Reg. Co.
Eclipse-Pioneer Div.
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Electrimatic Corp.
Electronic Lab.
Federal Telegraph Co.
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Fisher-Pierce Co.
Foxboro Co.
General Controls
General Elec. Co.
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Guardian Electric
Hagan Corp.
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Hart Mfg. Co.
Hays Corp.
H-B Electric
Illinois Eng. Co.
Infilco, Inc.
Kollsman Inst. Co.
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Leeds & Northrup
Leupold & Stevens
Mason-Neilan Regulator
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Perfex Corp.
Photobell Corp.
Polarad Electronics
Positel Mfg. Co.
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Robinette Co., W. C.
Schade Valve Mfg. Co.
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Seely Inst. Co., Inc.
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Leeds & Northrup Co.
Mason-Neilan Regulator
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Moore Products
Morey & Jones, Ltd.
Panoramic Radio Co.
Pioneer Instrument
Polarad Electronics
Republic Flow Meters
Statham Labs.
Taco Engineering
Tagliabue Div.
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Infilco, Inc.
Leupold & Stevens
Smith Meter Co.
Taco Engineering
Westinghouse Elec.

REMOTE-METERING EQUIPMENT, PNEUMATIC

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Automatic Temp. Control
Bristol Co.
Brown Inst. Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Mason-Neilan Regulator
Moore Products
Republic Flow Meters
Taco Engineering
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De Jur-Amsco
Eastern Specialty Co.
General Elec. Co.
Hardwick, Hindle, Inc.
International Resistance
Precision Resistor Co.
Shallcross Mfg.
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RESISTANCES

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Automatic Elec.
Beck Bros.
Central Scientific Co.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
General Elec. Co.
General Radio Co.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup
Madison Elec. Prod.
Mallory & Co.
Muter Co.
Ohmite Mfg. Co.
Precision Resistor Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Utah Radio Prods.
Ward Leonard
Westinghouse Elec.

RESISTORS, Adjustable

Allied Radio Corp.
Cutler-Hammer, Inc.
De Jur-Amsco
General Radio Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
Lectrohm Inc.
Leeds & Northrup
Mallory & Co.
Muter Co.
Ohmite Mfg. Co.

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RESISTORS, Adjustable (Cont'd)

Resistors, Inc.
Utah Radio Produs.
Walker-Jimieson, Inc.
Ward Leonard Electric Co.
Westinghouse Elec.

RESISTORS, Carbon Composition

Allen Bradley Co.
Beck Bros.
Eclipse-Pioneer Div.
Jas. G. Biddle Co.
International Resistance
Le Carbone Co., Inc.
Nat'l Carbon Co., Inc.
Ohio Carbon Co.
O. S. Peters
Speer Carbon Co.
Welch Mfg. Co.

RESISTORS, High Frequency

Beck Bros.
Clarke Inst. Corp.
Corning Glass Works
Daven Co.
Erie Resistor Corp.
General Elec. Co.
General Radio Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup Co.
Madison Elec. Prod.
Mallory & Co.
Measurements Corp.
Ohmite Mfg. Co.
Shallcross Mfg. Co.
Ward Leonard Electric Co.

RESISTORS, High Voltage

Beck Bros.
Clarostat Mfg. Co.
Cole Instrument
Cutler-Hammer, Inc.
Electronics, Inc.
General Elec. Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
J R L Instrument Co.
Madison Elec. Prod.
Ohmite Mfg. Co.
Reiner Electronics
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Electric Co.
Ward Leonard Electric Co.
Westinghouse Elec.

RESISTORS, Manganin

Beck Bros.
Cole Instrument
Daven Co.
De Jur-Amsco

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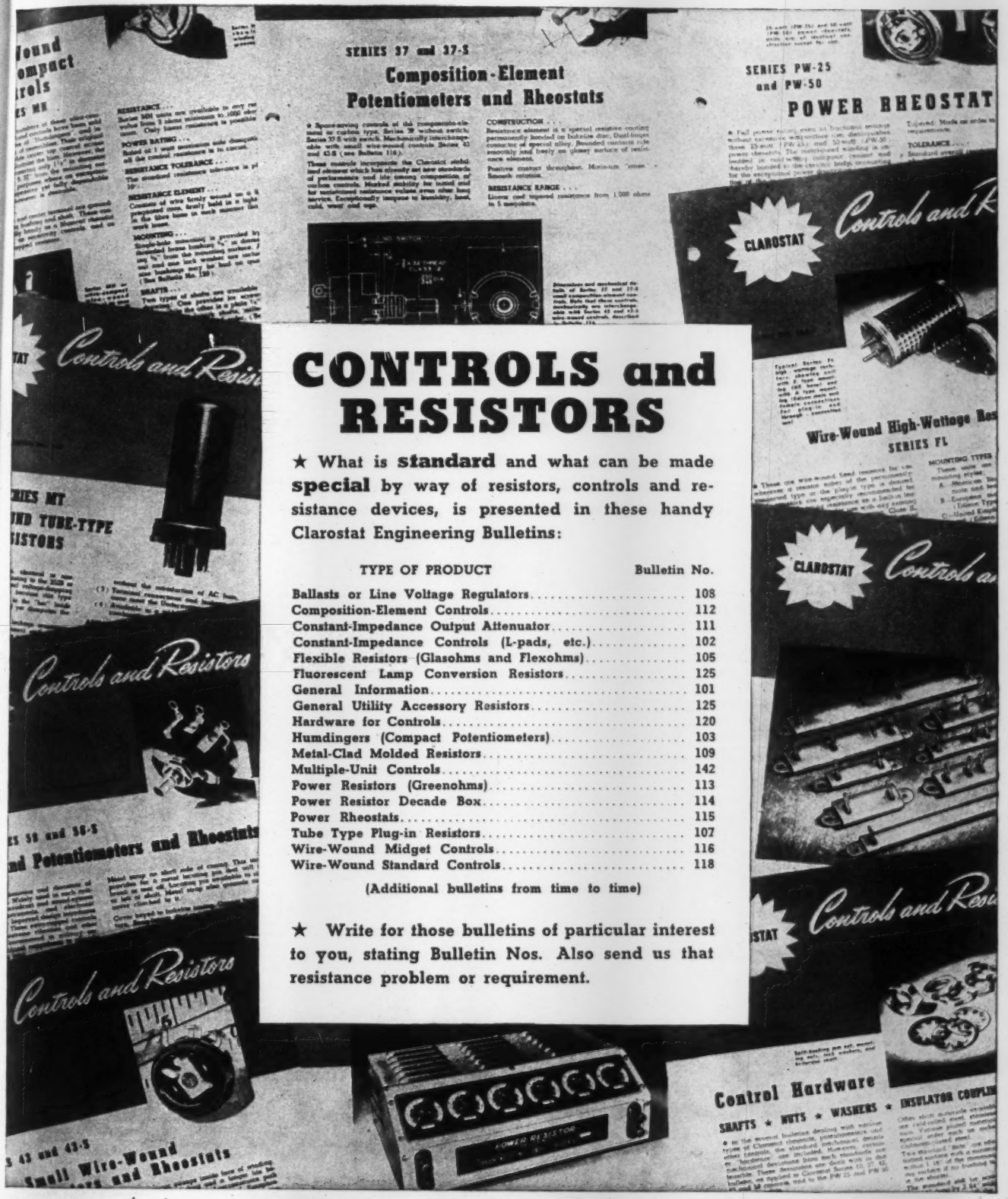

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★ What is **standard** and what can be made **special** by way of resistors, controls and resistance devices, is presented in these handy Clarostat Engineering Bulletins:

TYPE OF PRODUCT	Bulletin No.
Ballasts or Line Voltage Regulators	108
Composition-Element Controls	112
Constant-Impedance Output Attenuator	111
Constant-Impedance Controls (L-pads, etc.)	102
Flexible Resistors (Glasohms and Flexohms)	105
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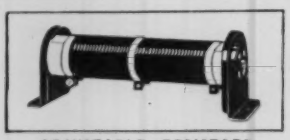

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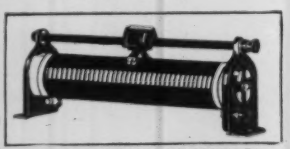

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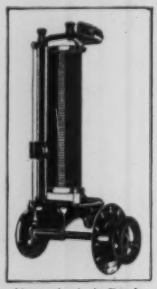
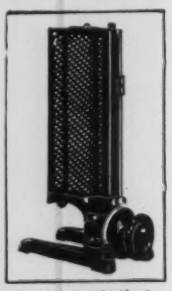


Unprotected Back Mounted Rotary Drive Rheostat.



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Instrument Resistors, Inc.
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Madison Elec. Prod.
Ohmite Mfg. Co.
Radio City Products
Reiner Electronics
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Triplett Elec. Inst.
Westinghouse Elec.

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Allen-Bradley Co.
Beck Bros.
Clarostat Mfg. Co.
Erie Resistor Corp.
General Elec. Co.
Instrument Resistors, Inc.
International Resistance
Madison Elec. Prod.
Muter Co
Ohmite Mfg. Co.
Radio City Products
Reiner Electronics
Triplett Electrical Inst.
Westinghouse Elec.

RESISTORS, Standard (See Standards, Resistance)

RESISTORS, Variable
Aerovox Corp.
Allen-Bradley Co.
Allied Radio Corp.
Beck Bros.
Jas. G. Biddle Co.
Carter Radio Div.
Centralab Div.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
Daven Co.
De Jur-Amsco
General Elec. Co.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
Lectrohm, Inc.
Leeds & Northrup Co.
Mallory & Co.
Muter Co.
National Elec. Controller
Ohmite Mfg. Co.
Resistors, Inc.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg.

RESISTORS, Wire Wound
Aerovox Corp.
Allied Radio Corp.
Associated Research
Automatic Elec.
Beck Bros.
Biddle Co., Jas. G.
Carter Radio Div.
Clarostat Mfg. Co.
Cole Instrument
Cutler-Hammer, Inc.
Daven Co.
De Jur-Amsco
Electronics, Inc.
General Elec. Co.
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
International Resistance
Lectrohm, Inc.
Leeds & Northrup Co.
Madison Elec. Prod.
Mallory & Co.
Muter Co.
National Electric Control
Ohmite Mfg. Co.
Resistors, Inc.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg. Co.
Simpson Electric Co.
Standard Science Sup.
Triplett Electrical Inst.
Utah Radio Prods.
Ward Leonard Electric Co.
Westinghouse Elec.

RHEOSTATS, Battery Charging
Allen-Bradley Co.
Beck Bros.
Cutler-Hammer, Inc.
De Jur-Amsco
Hardwick, Hindle, Inc.
International Resistance
National Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.

RHEOSTATS, Field
Cutler-Hammer, Inc.
Ohmite Mfg. Co.
Ward Leonard Elec. Co.

RHEOSTATS, Laboratory
Allen-Bradley Co.
American Inst. Co.
Beck Bros.
Biddle Co., Jas. G.
De Jur-Amsco Corp.
Carter Radio Div.
Centralab Div.
Central Scientific Co.
Chicago Apparatus Co.
Eastern Specialty Co.
(Cont'd)

RHEOSTATS, Laboratory (Cont'd)
General Radio Co.
G-M Labs.
Hardwick, Hindle, Inc.
Mallory & Co.
Muter Co.
National Elec. Controller
National Tech. Labs.
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Schaefer Bros. Co.
Sticht Co., Inc.
Thwing Albert Inst. Co.
Ward Leonard Elec. Co.

RHEOSTATS, Meter Testing
Allen-Bradley Co.
Beck Bros.
Biddle Co., Jas. G.
De Jur-Amsco Corp.
Eastern Specialty Co.
Hardwick, Hindle, Inc.
International Resistance
Leeds & Northrup
Mallory & Co.
National Elec. Controller
Ohmite Mfg. Co.
Shallcross Mfg.
States Co.
Ward Leonard Elec. Co.

RHEOSTATS, Slide Wire
Beck Bros.
Biddle Co., Jas. G.
Central Scientific Co.
Chicago Apparatus Co.
Cutler-Hammer, Inc.
General Radio Co.
Hardwick, Hindle, Inc.
Helipot Corp.
Leeds & Northrup
National Elec. Controller
National Tech. Labs.
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg. Co.
Sticht Co., Inc.
Thwing-Albert Inst. Co.
Utah Radio Prods.
Ward Leonard Elec. Co.
Welch Scientific

RIDEOMETERS, RIDE COMFORT Recorders & Riding-Quality Instruments
Commercial Research
Impact Register Co.
Jaeger Watch Co.
Sperry Products, Inc.
Waugh Laboratories

RULES, Adjustable Curve (See Drawing Instruments)

RULES, Aluminum
Keuffel & Esser Co.
Lufkin Rule Co.
Warren-Knight Co.

RULES, Brass
Bliss & Co.
Lufkin Rule Co.
Mico Instrument Co.
Starrett Co.
Warren-Knight Co.

RULES, Caliper
American Measuring Insts.
Glogau & Co.
Lufkin Rule Co.
Millers Falls Co.
Starrett Co.
Union Tool Co.
Warren-Knight Co.

RULES, Drafting Room (See Drawing Instruments)

RULES, Folding
Bliss & Co.
Dietzgen Co.
Keuffel & Esser Co.
Post Co., Frederick
Speidel & Co.
Starrett Co.
Warren-Knight Co.
Weber Co.

RULES, Glass
Fish-Schurman Co.
Glass Engraving Co.
Lufkin Rule Co.
Mico Instrument Co.
Scientific Glass App.

RULES, Parallel
Bliss & Co.
Dietzgen Co.
Hamilton Mfg. Co.
Keuffel & Esser Co.
Negus, T. S. & J. D.
Speidel & Co.
Warren-Knight Co.
White Co., Inc.
Weber Co.

RULES, Precision Standard
American Measuring Insts.
Gaertner Scientific Corp.
Lufkin Rule Co.
Starrett Co.

RULES, Shrinkage
Keuffel & Esser Co.
Lufkin Rule Co.
Speidel & Co.
Starrett Co.
Warren-Knight Co.
Weber Co.

RULES, Slide (See Drawing Instruments)

RULES, Slide, Psychrometric
Friez & Sons

RULES, Steel
American Measuring Insts.
Kern & Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Mico Instrument Co.
Millers Falls Co.
Scherr Co., Inc.
Speidel & Co.
Starrett Co.
Union Tool Co.
Warren-Knight Co.
Weber Co.

RULES, Wood
Henschel & Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Post Co., Frederick
Speidel & Co.
Warren-Knight Co.
Weber Co.

RUNNING TIME TOTALIZERS
Bristol Co.
Cramer Co., Inc.
Elec. Tachometer Corp
Gorrell & Gorrell
Jaeger Watch Co.
Production Instrument
Standard Elec. Time
Taco Engineering

SACCHARIMETERS
Akatos, Inc.
Bausch & Lomb Opt.
Central Scientific Co.
Elmer & Amend
Jarrell-Ash Co.
Kimble Glass
Moeller Instrument Co.
Rieker Inst. Co.
Sargent & Co.
Trerice Co.

SACCHAROMETERS
Central Scientific Co.
Elmer & Amend
Fleischhauer & Son
Griebel Co.
G. M. Mfg. Co., Inc.
H.B Inst. Co.
Kimble Glass Co.
Moeller Instrument Co.
Precision Therm. & Inst.
Rascher & Betzold
Rieker Inst. Co.
Ruehfel Co.
Scientific Inst. Co.
Tagliabue Div.
Taylor Inst. Cos.
Testrite Instrument Co.
Trerice Co.
Wagner & Son
Weksler Thermometer

SALINITY INDICATORS
Bendix Marine Products
Central Scientific Co.
Elmer & Amend
Engineering Labs., Inc.
Fleischhauer & Son
G. M. Mfg. Co., Inc.
H-B Inst. Co.
Instrument Lab., Inc.
Leeds & Northrup Co.
McNab of Bridgeport
Moeller Inst. Co.
Precision Therm. & Inst
Rascher & Betzold
Rubicon Co.
Ruehfel Co.
Schultheis Corp.
Scientific Inst. Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co
Weksler Thermometer
Westinghouse Elec.

SALINOMETERS (See Salinity Indicators)

SAMPLER, Boiler Water
Natl. Aluminate Corp.
Tagliabue Div.

SAMPLERS, Oil
Braun Corp.
Central Scientific Co.
Johnston & Jennings Co.
Pgh. Equitable Meter
Precision Scientific
Proportioneers, Inc.
Refinery Supply Co.
Scientific Glass Apparatus
Tagliabue Div.

SAMPLERS, Oil Bottom-hole
Precision Scientific
Ruska Inst. Corp.

SAMPLERS, Sewage
Builders-Providence
Central Scientific Co.
Infilco, Inc.
Precision Scientific
Scientific Glass Apparatus
Thwing-Albert Inst.

SAMPLERS, Silt
Central Scientific Co.
Leupold & Stevens

SCALES (See also object of Measurement and Control

SCALES, Antimony Test
Howe Scale Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Automatic
Automatic Scale Co.
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
(Cont'd)

SCALES, Automatic (Cont'd)
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Porter, George K.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Taco Engineering
Toledo Scale Co.
Triangle Package Mach.
Triner Sales Co.

SCALES, Bag Filling
Automatic Scale Co.
Exact Weight Scale Co.
Fairbanks, Moore & Co.
Gump Co.
Jacobs Bros. Co.
Richardson Scale Co.
Toledo Scale Co.
Triangle Package Mach.

SCALES, Basis Weight
Amthor Testing Inst. Co.
Becker, Inc., Christian
Buffalo Scale Co.
Exact Scale Co.
Howe Scale Co.
Seederer-Kohlbusch
Thwing-Albert Instrument
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Bulk Weighing
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Jacobs Bros. Co.
Merrick Scale Mfg.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Cement Batching
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.
Triner Sales Co.

SCALES, Checking
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Classifying
Chatillon & Sons
Exact Weight Scale Co.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Toledo Scale Co.
Triner Sales Co.

SCALES Computing
Amthor Testing Inst.
Exact Weight Scale
International Bus. Mach.
Jacobs Bros., Inc.
Toledo Scale Co.
Triner Sales Co.

SCALES, Continuous Weighing
Buffalo Scale Co.
Builders-Providence
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Jacobs Bros. Co.
Jeffrey Mfg. Co.
Merrick Scale Mfg. Co.
Omega Machine
Porter, George K.
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Taco Engineering
Toledo Scale Co.
Triangle Package Mach.
United Cinephone Corp.

SCALES, Conveyor
Builders-Providence
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Merrick Scale Mfg. Co.
Omega Machine
Richardson Scale Co.
Schaffer Poidometer Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Counting
Amthor Testing Inst. Co.
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Seederer-Kohlbusch
Taco Engineering
Toledo Scale Co.
Triner Sales Co.
United Cinephone Corp.

SCALES, Crane
Buffalo Scale Co.
Chatillon & Sons
Fairbanks, Morse & Co.
Howe Scale Co.

SCALES, Dairy
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Jacobs Bros. Co.
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.
Troemner, Henry

SCALES, Differential
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Jacobs Bros. Co., Inc.
Taco Engineering
Thwing-Albert Instrument

SCALES, Drawing (See Drawing Instruments)

SCALES, Dump
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Toledo Scale Co.

SCALES, Dynamometer
Central Scientific Co.
Chatillon & Sons
Dillon & Co.
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
Martin Decker Corp.
Porter, George K.
Republic Flow Meters
Seederer-Kohlbusch, Inc.
Stoelting Co., C. N.
Toledo Scale Co.

SCALES, Estimating
Exact Weight Scale Co.
Jacobs Bros. Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Grain & Seed Testing
Amthor Testing Inst. Co.
Automatic Scale Co.
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Fisher Scientific Co.
Gump Co.
Howe Scale Co.
Jacobs Bros. Co.
Newark Scale Works
Richardson Scale Co.
Seedburo Equipment
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Hopper
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
Jacobs Bros. Co.
Richardson Scale Co.
Seedburo Equipment
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Laboratory
Becker, Inc., Christian
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Chicago Apparatus Co.
Clay-Adams Co.
Dietert Co.
Eberbach & Son
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Fisher Scientific Co.
Goetze Niemer Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Jacobs Bros. Co.
Microchemical Service
Newark Scale Works
Seedburo Equipment
Seederer-Kohlbusch, Inc.
Thompson Balance
Toledo Scale Co.
Torsion Balance Co.
Troemner, Henry
Voland & Sons

SCALES, Lorry Car
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Richardson Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Liquid
Jacobs Bros. Co., Inc.
Merrick Scale Mfg.
Richardson Scale Co.

SCALES, Loss of Weight
Becker, Inc., Christian
Buffalo Scale Co.
Builders-Providence
(Cont'd)

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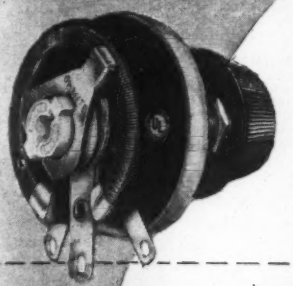

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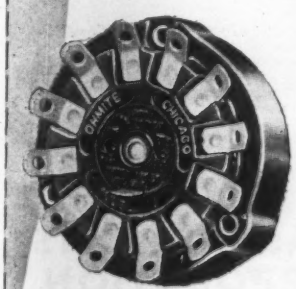

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... for organic analysis.

INFRA RED GAS ANALYZER

... for continuous, recorded analysis and for process control.

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... adapted to light-scattering, and high-accuracy index of refraction measurements in molecular weight determination and to other services in interferometry.

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... Wool testing equipment
... Surface finish standards

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SCALES, Loss of Weight (Cont'd)
Dietert Co.
Exact Weight Scale Co.
Jacobs Bros. Co.
Omega Machine
Proportioneers, Inc.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Thwing-Albert Inst.
Toledo Scale Co.
Torsion Balance Co.

SCALES, Measuring
Automatic Scale Co.
Dietzgen Co.
Eitzen Co.
Howe Scale Co.
Porter, George K.
Richardson Scale Co.
Triner Sales Co.

SCALES, Over & Under
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Moisture Register Co.
Seedburo Equipment
Streeter-Amet Co.
Taco Engineering
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.
Troemner, Henry

SCALES, Packaging
Automatic Scale Co.
Becker, Inc., Christian
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Pneumatic Scale Corp.
Richardson Scale Co.
Toledo Scale Co.
Torsion Balance Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry

SCALES, Platform
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
Humboldt Mfg. Co.
International Bus. Mach.
Knowles Scale Works
Seedburo Equipment
Streeter-Amet Co.
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Portable
Black & Decker
Buffalo Scale Co.
Central Scientific Co.
Chatillon & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Knowles Scale Works
Kron Co.
Richardson Scale Co.
Toledo Scale Co.
Triner Sales Co.
Voland & Sons

SCALES, Predetermined Weight
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gump Co.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Schaffer Poidometer Co.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Taco Engineering
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Recording
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Merrick Scale Mfg. Co.
Porter, George K.
Richardson Scale Co.
Streeter-Amet Co.
Taco Engineering
Toledo Scale Co.
Wallace & Tiernan

SCALES, Remote Indicating
Exact Weight Scale
Merrick Scale Mfg.
Porter, George K.
Republic Flow Meters
Taco Engineering
Toledo Scale Co.

SCALES, Rolling Mill
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Sacking (See Scales, Bag-Filling)

SCALES, Selecting
Exact Weight Scale
Merrick Scale Mfg.
Toledo Scale Co.
United Cinephone Corp.

SCALES, Solder Test
Central Scientific Co.
Exact Weight Scale
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Steel
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
Lufkin Rule Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Testing
Becker, Inc., Christian
Buffalo Scale Co.
Chatillon & Sons
Eberbach & Sons
Exact Weight Scale
Gump Co.
Howe Scale Co.
Humboldt Mfg. Co.
Jacobs Bros. Co.
Newark Scale Works
Toledo Scale Co.
Torsion Balance Co.

SCALES, Textile
Becker, Inc., Christian
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Saxl Instrument Co.
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Suter, Alfred
Toledo Scale Co.
Torsion Balance Co.
Triner Sales Co.

SCALES, Track
Buffalo Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Truck
Black & Becker
Buffalo Scale Co.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Howe Scale Co.
Streeter-Amet Co.
Toledo Scale Co.

SCALES, Water Meter
Alsender & Sons
Exact Weight Scale
Fairbanks, Morse & Co.
Jacobs Bros. Co.
Toledo Scale Co.

SCALES, Yardage
Amthor Testing Inst.
Brown & Sharpe
Buffalo Scale Co.
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale Co.
International Bus. Mach.
Kron Co.
Toledo Scale Co.

SCREENS, Solar Projecting
Fecker, J. W.

SCREENS, X-Ray Fluoroscopic
Cadillac Glass Co.
General Electric X-Ray
Goetze Niemer Co.
Kelley-Koett Mfg. Co.
Patterson Screen Div.
Stoelting Co., C. H.
Westinghouse Elec.
Westinghouse X-Ray Co.

SCREENS, X-Ray Intensifying (See Screens X-Ray Fluoroscopic)

SEED SIEVE SETS
Ballauf Mfg. Co.
Seedburo Equipment

SEGER CONES (See Cones, Pyrometric)

SEISMOGRAPHS
Akatos, Inc.
Alpha Instrument Co.
American Inst. Co.
Am. Telescope Labs.
Brown Geophysical
Consolidated Engg.
Engineering Labs., Inc.
Geophysical Instrument
Hathaway Instrument
Henson Co., Fred C.
Heiland Research Corp.
Mico Instrument Co.
Miller Corp., Wm.

SELF-OPERATING CONTROLLERS & REGULATORS, AUTOMATIC
Am. Automatic Elec.
American Inst. Co.
Area Regulators, Inc.
Automatic Elec. Sales
Bailey Meter Co.
Bastian-Blessing
Beck Co.
Belfield Co.
Betts & Betts
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cutler-Hammer, Inc.
D'Este Co.
Dickson Co.
Elec. Indicator Corp.
Fischer & Porter
Fisher-Pierce Co.
Foxboro Co.
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SELF-OPERATING (Cont'd)
Hanlon-Waters, Inc.
Kiely & Mueller
Lammert & Mann Co.
Leeds & Northrup Co.
Leslie Co.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Partlow Corp.
Penn Electric Switch Co.
Perfex Corp.
Ruggles-Klingemann
Scientific Inst. Co.
Shallcross Controls
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
United Transformer
Wheelco Instruments

SERVO-MOTORS, Electric Motor
Automatic Temp. Control
Barber-Colman
Beck Co.
Brown Inst. Co.
Eclipse-Pioneer Div.
General Elec. Co.
General Regulator Corp.
L. A. B. Corp.
Minneapolis-Honeywell
Robinette Co., W. C.
Shallcross Controls
Wilson & Co.

SERVO-MOTORS, Electric Solenoid
Brown Inst. Co.
Ruggles-Klingemann
Shallcross Controls
Taco Engineering

SERVO-MOTORS, Hydraulic
Adel Precision
Askania Regulator Co.
Bailey Meter Co.
Cash Co.
General Regulator Corp.
Hagan Corp.
Mason-Neilan Regulator
Republic Flow Meters
Ruggles-Klingemann
Shallcross Controls

SERVO-MOTORS, Mechanical
Foxboro Co.
Hagan Corp.

SERVO-MOTORS, Pneumatic
Askania Regulator Co.
Bailey Meter Co.
Brown Inst. Co.
(Cont'd)

SERVO MOTORS (Cont'd)
Cash Co.
Hagan Corp.
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
Republic Flow Meters

SEXTANTS
Alpha Instrument Co.
Bausch & Lomb Opt.
Eclipse-Pioneer Div.
Kern Co.
Keuffel & Esser Co.
Kuner Co., Max
Leupold & Stevens
Link Aviation Devices
Master Optical Co.
Negus, T. S. & J. D.
Pioneer Instrument Co.
Roth Bros. Chronometer
Unertl Optical Co.
Warren-Knight Co.
White Co., Inc.

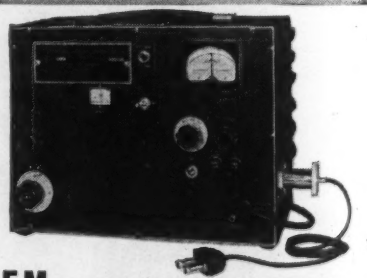
SHIP LOGS
Elec. Tachometer Corp.
Kenyon Instrument Co.
Negus, T. S. & J. D.
Pitometer Log Corp.

SHUNT METERS (See Meters, Shunt)

SHUNTS
Associated Research
Burton-Rogers Co.
Cole Instrument
Columbia Elec. Mfg.
De Jur-Amsco
Electronics, Inc.
Esterline-Angus Co.
General Elec. Co.
Hickok Elec. Inst. Co.
Instrument Resistors, Inc.
International Resistance
Precision Resistor Co.
Radio City Products Co.
Rawson Electrical Inst.
Reiner Electronics
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg.
Standard Science Sup.
Simpson Electric Co.
Sun Manufacturing
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

SHUNTS, Standard
Cambridge Instrument Co.
Cole Instrument
De Jur-Amsco
Electronics, Inc.
Esterline-Angus Co.
General Electric Co.
Gray Instrument Co.
(Cont'd)

Laboratory Standards



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SHUNTS, Standard (Cont'd)
Hickok Electrical Inst.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg.
Triplett Elec. Inst. Co.
Weston Elec. Inst. Corp.

SIEVE SHAKERS
American Inst. Co.
Braun Corp.
Central Scientific
Dietert Co.
Humboldt Mfg. Co.
Newark Wire Cloth
Precision Scientific

SIEVES, TESTING
American Inst. Co.
Central Scientific Co.
Dietert Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Newark Wire Cloth
Precision Scientific Co.
Richie Division
Scientific Inst. Co.
Weber Brothers Metal

SIGHT FEED BUBBLERS
Bailey Meter Co.
Meriam Co.
Moore Products

SIGHT METERS
De Jur-Amsco
General Elec. Co.
G-M Labs.
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

SIGHTS, GUN, Telescopic
Bausch & Lomb Opt.
Bell & Howell Co.
Clark & Sons
Fecker, J. W.
Kollmorgen Optical Co.
Leupold & Stevens
Perkin-Elmer Corp.
Plummer & Kershaw
Stafford Co.
Unertl Optical Co.
Zeiss, Inc., Carl

SIGNAL GENERATORS (See Generators, Signal)

SIGNALING DEVICES, Automatic
American Automatic Elec.
Autocall Co.
Automatic Elec. Mfg.
Automatic Elec. Sales
Automatic Temp. Control
Beck Co.
Betts & Betts
Bullard Co.
Cannon Electric
Cincinnati Time Rec.
Elec. Indicator Corp.
Fischer & Porter
Foxboro Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Holtzer-Cabot Elec. Co.
Industrial Timer Corp.
International Bus. Mach.
Leslie Co.
Leupold & Stevens
Mine Safety App. Co.
National Time & Signal
Production Instrument
Spence Engineering Co.
Standard Elec. Time
Taco Engineering
Thompson Clock Co.
United Cinephone Corp.
Wallace & Tiernan
Warren Telechron
Wheelco Instruments

SIGNALING DEVICES, Traffic
Am. Gas Accumulator
Automatic Temp. Control
Bullard Co.
Eagle Signal Corp.
Edison Electrical Controls
General Elec. Co.
National Time & Signal
Sangamo Electric Co.
Taco Engineering

SILICA, VITREOUS
Crystal Research Labs.
Thermal Syndicate, Ltd.

SINE BARS
Ford Motor Co.
Herkimer Tool
Jansson Gage Co.
Thomas Tool
Vinco Corp.

SLIDE RULES (See Drawing Instruments)

SLIDING GAGES (See Gages, Sliding)

SLOW MOTION STUDY EQUIPMENT
Annis Co.
Boulin Instrument Corp.
Commercial Engg. Labs.
General Radio Co.
Telechron, Inc.

SLUMP CONES (See Cones, Slump)

SMOKE DENSITY, Indicators & Recorders
Airdesign, Inc.
Associated Research
Bailey Meter Co.
Bristol Co.
Boiler Room Equip.
Brooke Engineering
Denver Fire Clay Co.
Dickson Co.
Electronic Lab.
Electronic Prod. Co.
Esi Instrument Co.
General Elec. Co.
General Television Corp.
Leeds & Northrup Co.
Lumenite Elec. Co.
Madison Elec. Prod.
McNeill Eng. Equip.
Photobell Corp.
Photoswitch, Inc.
Photovolt Corp.
Preferred Utilities Mfg.
Refinery Supply
Taco Engineering
United Cinephone Corp.
Weston Elec. Inst. Corp.
Worner Products

SMOOTHNESS RECORDERS (See Surface Finish Analyzers)

SOLAR PROJECTING SCREEN (See Screen, Solar Projecting)

SOUND INDICATORS & ANALYZERS (See Indicators, Sound & Analyzers, Sound)

SOUND LEVEL METERS
Amplifier Co.
Ballantine Labs.
Clough-Brengle Co.
Cole Instrument
Daven Co.
De Jur-Amsco Corp.
Electronic Design Corp.
Electronic Development
Electronics, Inc.
General Elec. Co.
General Radio Co.
Marion Electrical Inst.
M B Mfg. Co.
Meters, Inc.
Precision Apparatus Corp.
Radio City Products Co.
Shallcross Mfg. Co.
Sherron Metallic
Simpson Electric
Sound Apparatus Co.
Taco Engineering
Triplett Electrical Inst.
Waugh Laboratories
Western Electric
Westinghouse Elec
Weston Elec. Inst. Corp.

SOUNDING LEADS
Ballauf Mfg. Co.
Bliss & Co.
Kenyon Instrument Co.
Kuner Co., Max
Moeller Instrument Co.
Negus, T. S & J. D.

SOUNDING MACHINES
Ballauf Mfg. Co.
Bendix Marine Products
Kenyon Instrument Co.
Kuner Co., Max
Moeller Instrument Co.
Negus, T. S & J. D.
Stafford Co.
Submarine Signal Co.

SOUNDING TUBES
Ballauf Mfg. Co.
Kimble Glass Co.
Leupold & Stevens
Moeller Instrument Co.
Negus, T. S. & J. D.

SPECIFIC GRAVITY Indicators & Recorders
American Meter Co.
Bailey Meter Co.
Builders-Providence
Elmer & Amend
(Cont'd)

SPECIFIC GRAVITY (Cont'd)
Fischer & Porter
Foxboro Co.
Refinery Supply Co.
G.M. Mfg. Co.
Leeds & Northrup
Moeller Inst. Co.
Moore Products
Precision Scientific
Refinery Supply
Republic Flow Meters
Ring Balance Inst.
Ruehfel Co.
Schultheis Corp.
Scientific Inst. Co.
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Wallace & Tiernan

SPECTRA DEMONSTRATORS
Baird Associates
Central Scientific Co.
Eastern Science Co.
Fuess, Inc.
Gaertner Scientific Corp.

SPECTRAL TUBES CONTAINING RARE GASES (See Spectrum Tubes)

SPECTROGRAPHS
Baird Associates
Bausch & Lomb Optical
Bryden Co.
Buehler, Adolph I.
Gaertner Scientific Corp.
Henson Co., Fred C.
Jarrell-Ash
Spencer Lens Co.
Zeiss, Inc., Carl

SPECTROGRAPHS, Diffraction Grating
Applied Research Labs.
Baird Associates
Central Scientific
Dearborn Scientific
Dietert Co.
Jarrell-Ash Co.

SPECTROGRAPHS, Oscillating
General Elec. Co.
Hayes Scientific App.

SPECTROGRAPHS, Vacuum
Central Scientific Co.
Dietert Co.
Fecker, J. W.
Fuess, Inc.
Jarrell-Ash Co.

SPECTROGRAPHS, X-ray
Central Scientific Co.
Fuess, Inc.
Gaertner Scientific
General Electric X-Ray
Hayes Scientific App.
Henson Co., Fred C.
Jarrell-Ash Co.
Kelley-Koett Mfg.
North Amer. Philips
Victoreen Instrument Co.

SPECTROMETERS
American Optical
Bausch & Lomb Optical
Consolidated Engg.
Dearborn Scientific
Fuess, Inc.
Gaertner Scientific
Jarrell-Ash Co.
Rudolph & Sons
Welch Scientific

SPECTROMETERS, Recording Mass
Berkeley Scientific
Consolidated Engg.
General Elec. Co.

SPECTROMETER, Infra-Red
Baird Associates
Gaertner Scientific Corp.
General Elec. Co.
Jarrell-Ash Co.
Perkin-Elmer Corp.
Pfaltz & Bauer

SPECTROMETERS, X-RAY (See Spectographs, X-Ray)

SPECTRO-PHOTOMETERS (See Photometers, Spectro)

SPECTROSCOPES
Bausch & Lomb Opt.
Buehler, Adolph I.
Dearborn Scientific
Electronic Engineers
Fish-Schurman Corp.
Fuess, Inc.
(Cont'd)

SPECTROSCOPES (Cont'd)
Gaertner Scientific Corp.
Jarrell-Ash Co.
Laboratory Specialties
Leitz, Inc.
Spencer Lens Co.
Welch Scientific

SPECTROSCOPE, Quartz
Buehler, Adolph I.
Gaertner Scientific Corp.

SPECTROSCOPES, Stellar
Am. Telescope Labs.
Central Scientific Co.
Eastern Science Co.
Fecker, J. W.
Mico Instrument Co.
Perkins-Elmer Corp.
Zeiss, Inc., Carl

SPECTRUM TUBES
Central Scientific Co.
Fuess, Inc.
Gaertner Scientific Corp.
General Physical Lab.
Jarrell-Ash Co.

SPEED, Indicators
Amthor Testing Inst. Co.
Anderson Co.
Associated Research
Automatic Elec.
Bailey Meter Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Bristol Co.
Brown Inst. Co.
Chicago Elec. Tachometer
Cole Instrument
Commercial Research
Cramer & Co., Inc.
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Elgin National Watch
(Cont'd)

SPEED INDICATORS (Cont'd)
Esterline-Angus Co.
Foxboro Co.
Gaertner Scientific Corp.
General Elec. Co.
Hasler-Tel Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Jaegar Watch Co.
Jones-Motrola
Leeds & Northrup Co.
Manning, Maxwell & Moore
Martin Decker Corp.
McDonnell Odometer Co.
Metron Instrument
Moisture Register Co.
Pioneer Instrument
Precision Therm.
Roller-Smith Co.
Scherr Co., Inc.
Sound Apparatus Co.
Standard Elec. Time
Starrett Co.
Sticht & Co.
Taco Engineering
Triplett Elec. Inst.
Valve Pilot Corp.
(Locomotive)
Veeder-Root, Inc.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Zernickow Co., O.

SPEED, Recorders (See Speed Indicators)

SPEED, Regulators (See Controllers, Automatic, Tachometric)

SPEED SYNCHRONIZING INDICATORS
Electric Speed Ind. Co.
General Elec. Co.

SPEEDOMETERS
Boulin Instrument Corp.
Central Scientific Co.
Corbin Screw Corp.
Cramer & Co., Inc.
Electric Auto-Lite
Elec. Tachometer Corp.
General Elec. Co.
Jones-Motrola
Knopf, Paul
Stewart-Warner Corp.
Westinghouse Elec. & Mfg.
American Askania Corp.
Central Scientific Co.
Ferner Co.
Fish-Schurman Co.
Fuess, Inc.
Gaertner Scientific Corp.
Merkle Korff Gear
Ruska & Co.
Selsi Co., Inc.
Waltham Watch Co.
Welch Scientific Co.

SPHYGMOMANOMETERS
Cambridge Inst. Co.
Hellige, Inc.
Precision Thermometer
Stoelting Co., C. H.
Taco Engineering
Taylor Inst. Cos.

SQUARES, Combination & Machinists'
Brown & Sharpe
DoAll Co.
Lufkin Rule Co.
Jansson Gage Co.
Mico Instrument Co.
Millers Falls
Starrett Co.
Thomas Tool
Union Tool Co.
Vinco Corp.
Warren-Knight Co.

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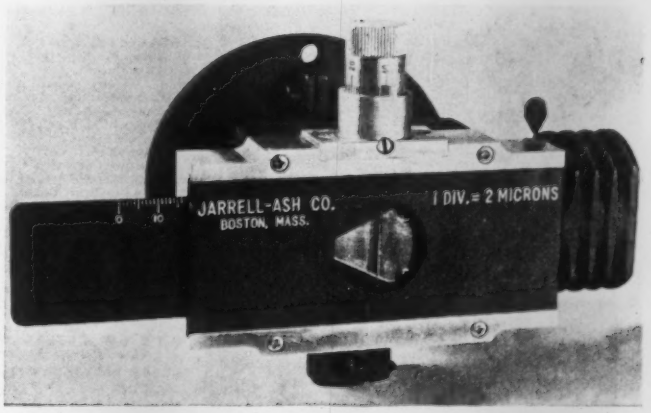

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Bilateral Slits as used on the Jaco Stigmatic Grating Spectrographs have jaws riding on balls in hardened ways. They are symmetrical, spring closing, with a stop to prevent overrunning the zero. The vernier reads to 2 microns. They may be supplied with an electromagnetic shutter behind the jaws and with a focussing tube.

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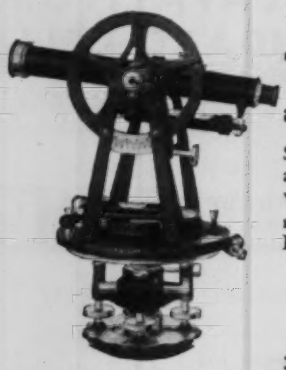

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STANDARDS, Acoustic
Massa Laboratories

STANDARDS, Capacitance
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General Radio Co.
Industrial Instruments
Leeds & Northrup Co.
Rubicon Co.
Solar Mfg. Corp.

STANDARDS, Color
Fish-Schurman Co.
Hellige, Inc.
Munsell Color Co.
Tagliabue Div.

STANDARDS, E.m.f.
Cambridge Inst. Co.
Espey Mfg.
Leeds & Northrup Co.
Rubicon Co.

STANDARDS, Frequency
American Inst. Co.
American Time Prods.
Andrew, Victor J.
Crystal Research Labs.
Espey Mfg.
Ferris Inst. Corp.
General Radio Co.
(Cont'd)

STANDARDS, Frequency (Cont'd)
Hewlett-Packard Co.
MacLeod & Hanopol
Millen Mfg. Co.
RCA Manufacturing
Sherron Metallic
Warren Telechron Co.
Western Electric

STANDARDS, Inductance
Cambridge Inst. Co.
General Radio Co.
Leeds & Northrup Co.
Rubicon Co.

STANDARDS, Length
Acme Industrial
Gaertner Scientific Corp.
Gurley, W. & L. E.
Size Control Co.
Van Keuren Co.

STANDARDS, Mass
Gurley, W. & L. E.
Seederer-Kohlbusch, Inc.

STANDARDS, Potential
Leeds & Northrup Co.
Rubicon Co.
Sensitive Research Inst.
Taco Engineering

STANDARDS, Pressure
Green, Henry J.
Precision Therm.

STANDARDS, Resistance
American Radio Co.
Beck Bros.
Cambridge Inst. Co.
Cole Instrument
Cutler-Hammer, Inc.
Electronics, Inc.
General Radio Co.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup Co.
Rubicon Co.
Sensitive Research Inst.
Shalleross Mfg. Co.
Sticht & Co.
Taco Engineering
Utah Radio Prod.
Victoreen Instrument Co.
Ward Leonard Elec. Co.

STANDARDS, Sound Level
General Radio Co.
Western Electric

STANDARDS, Surface Roughness
Surface Checking Gage
Baird Associates

STANDARDS, Temperature
Green, Henry J.
Leeds & Northrup Co.
Moeller Instrument Co.
Precision Therm.
Revere Co.
Taco Engineering
Tagliabue Div.

STANDARDS, Time
American Inst. Co.
American Time Prods.
Gaertner Scientific Corp.
General Radio Co.
Standard Elec. Time Co.
Stoelting Co., C. H.
Warren Telechron Co.

STANDARDS, Volume
Gurley, W. & L. E.

STARTERS, MOTOR
Allen-Bradley Co.
Allis-Chalmers
B. W. Controller
Cutler-Hammer, Inc.
Eclipse Aviation
Federal Telegraph Co.
Furnas Electric Co.
General Elec. Co.
Monitor-Controller Co.
Penn Electric Switch Co.
Schaefer Bros. Co.
Ward Leonard Elec. Co.

STATION CONTROL EQUIPMENT
American Meter Co.
Area Regulators, Inc.
Elec. Indicator Corp.
General Elec. Co.
RCA Manufacturing
Sherron Metallic

STEAM METERS (See Flow Meters, Steam)

STEEL TAPES (See Tapes, Steel)

STELLAR SPECTROSCOPES (See Spectroscopes, Stellar)

STEREOSCOPES
Abrams Instrument
Kelly-Koett Mfg. Co.

STEREOSCOPES, X-Ray
Abrams Instrument
Bausch & Lomb Optical
Kelley-Koett Mfg. Co.
Westinghouse Elec.
Westinghouse X-Ray Co.

STETHOSCOPES, ENGINEERS
Brush Development Co.
Gilmore, E. R.
Tost-A-Tone Co.

STIFFNESS TESTERS, PAPER (See Tester, Stiffness, Paper)

STILLS, AUTOMATIC WATER
Barnstead Still & Steril.
Central Scientific Co.
Fish-Schurman Co.
Goetze Niemer
(Cont'd)

STILLS, Automatic, Water (Cont'd)
Precision Scientific
Ruska Inst. Corp.
Specialty Glass Co.
Stokes Machine Co.
Weber Bros. Metal Works

STIRRERS, LABORATORY, Variable Speed
American Inst. Co.
Central Scientific
Eastern Engg. Co.
Eberbach & Son
Fish-Schurman Corp.
Fisher Scientific
Precision Scientific
Technical Products

STOP WATCHES (See Watches, Stop)

STRAIGHT EDGES
Acme Industrial
Brown & Sharpe
Bruning Co., Inc.
Dietzgen Co.
Ford Motor Co.
Keuffel & Esser Co.
George Scherr Co.
Soltmann, Inc.
Speidel & Co.
Warren-Knight Co.
Weber Co., F.
White Co. Inc.

STRAIGHTENING VANES
Bailey Meter Co.
Builders Providence
Robinson Orifice Fitting
Simplex Valve & Meter

STRAIN GAGES (See Gages, Strain)

STRAIN TESTERS, GLASS (See Testers, Strain (Glass)

STRAIN-TIME RECORDERS
Bailey Meter Co.
Baldwin-Southwark Corp.
Brush Development
Cambridge Inst. Co.
Foxboro Co.
Hathaway Instrument
Keuffel & Esser Co.

STREAM GAGING INSTRUMENTS
Foxboro Co.
Gurley, W. & L. E.
Hathaway Instrument
Keuffel & Esser Co.
Leupold & Stevens
Morey & Jones, Ltd.
Trimount Inst. Co.

STOP WATCHES see Watches, Stop

STRESS INDICATORS
Ames Co., B. C.
Bailey Meter Co.
Baldwin-Southwark Corp.
Cambridge Inst. Co.
Consolidated Engg.
Federal Products Corp.
Hathaway Instrument
Magnaflux Corp.
Martin Decker Corp.
Metron Instrument
Riehle Div.
Statham Labs.
Taco Engineering

STRESS-STRAIN, Indicators
Ames Co., B. C.
Bailey Meter Co.
Baldwin-Southwark Corp.
Brush Development
Buehler, Adolph I.
Chatillon & Sons
Consolidated Engg.
Hathaway Instrument
Magnaflux Corp.
Metron Instruments
Taco Engineering
Trimount Inst. Co.

STRESS-STRAIN, Recorders
Bailey Meter Co.
Baldwin-Southwark Corp.
Brush Development
Cambridge Inst. Co.
(Cont'd)

STRESS-STRAIN (Cont'd)
Consolidated Engg.
Hathaway Instrument
Metron Instruments
Olsen Testing Machine
Riehle Div.
Taco Engineering
Trimount Inst. Co.

STROBOSCOPES
Boulin Inst. Corp.
Commercial Research
Communication Meas. Lab.
Electronic Engineers
General Radio Co.
Knickerbocker Dev.
Pioneer Instrument
Taco Engineering
Welch Mfg. Co.
Westinghouse Elec.
Zeiss, Inc., Carl

SULPHUR BOMBS (See Bombs, Sulphur)

SULPHUR DIOXIDE, Indicators (See Gas Analyzers, Sulphur Dioxide) **Recorders** (See Gas Analyzers, Sulphur Dioxide)

SUN COMPASS
Abrams Instrument
Geophysical Inst. Co.

SUNSHINE, Indicators & Recorders
Cambridge Inst. Co.
Esterline-Angus Co.
Friez & Sons
Fuess, Inc.
General Elec. Co.
G. M. Mfg. Co., Inc.
Leeds & Northrup
Taylor Inst. Cos.
White Co. Inc.

SUPERVISORY CONTROL EQUIPMENT
American Automatic Elec.
Autocall Co.
Bristol Co.
Builders Providence
Control Corp.
Cramer & Co., Inc.
General Elec. Co.
Guardian Elec. Mfg. Co.
Leeds & Northrup Co.
Tagliabue Div.
Westinghouse Elec.

SURFACE FINISH COMPARATORS (See Comparators, Surface Finish

SURFACE FINISH TESTERS
Baird Associates
Brush Development Co.
Buehler, Adolph I.
Comtor Co.
General Elec. Co.
Physicists Research
Swedish Gage
Taber Inst. Corp.
Wilder, R. S.

SURFACE GAGES (See Gages, Surface)

SURFACE PLATES, GLASS
Bausch & Lomb Optical
Binswanger & Co.
Cadillac Glass Co.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Geophysical Inst. Co.
Mogey & Sons
Ruska & Co.
Zeiss, Inc., Carl

SURFACE PLATES, STONE
Herman Stone Co.

SURGE CREST AMMETERS (Ammeters, Surge-Crest)

SURGE, Indicators & Recorders
Cook Electric
Elec. Indicator Corp.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr
Taylor Inst. Co.

SURVEYING INSTRUMENTS
Abrams Instrument
Alpha Instrument Co.
Beckmann Co., L.
Berger & Sons
Bliss & Co.
Bostrom-Brady
Bray Optical Co.
Bruning Co., Inc.
Dietzgen Co.
Ferner Co.
Goldak Co.
Gurley, W. & L. E.
Kaeyon Instrument Co.
Kern Co.
Keuffel & Esser Co.
Kolesch & Company
Leupold & Stevens
Lufkin Rule Co.
Pittsburgh Inst. & Mach.
Post Co., Frederick
Speedometer Electric Co.
Spaidel & Co.
Starrett Co.
Suverkrop Instruments
Ulmer Co., J. C.
United States Blue Print
Warren-Knight Co.
Weber Co.
White Co. Ins.
Zeiss, Inc., Carl

SURVEYING INSTRUMENTS, Aerop...
Am. Paulin Sys...
Dietzgen Co.
Wallace & Tierna...
White Co.

SURVEYING INSTRUMENTS, Underground, for wells or bore-hole
H. Cole Co.
Driftmeters, Inc.
Engineering Labs., Inc.
Geophysical Inst. Co.
Halliburton Oil Well...
Holland Research
Ruska & Co.
Sperry-Sun Well Survey.
Warren-Knight Co.
White Co.

SURVEYOR'S CHAINS (See Surveying Instruments)

SWITCHES, Air-operated
Automatic Temp. Control
Cook Electric
Cutler-Hammer, Inc.
General Electric Co.
Johnson Service Co.
Meletron Corp.
Mu-Switch Corp.
Shalleross Mfg. Co.
Taco Engineering
Tagliabue Div.
Westinghouse Elec.

SWITCHES, Automatic Transfer
Allen-Bradley Co.
Allied Control Co.
Anderson, A. & J. M.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Electric Sales
Automatic Switch Co.
Automatic Temp. Control
Barber-Colman
Cook Electric
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Federal Telegraph Co.
General Elec. Co.
Hart Mfg. Co.
Monitor Controller Co.
Taco Engineering
Ward Leonard Elec. Co.
Westinghouse Elec.
Zenith Electric Co.

SWITCHES, Instrument
Allied Control Co.
Allis-Chalmers
Autocall Co.
Automatic Electric
Automatic Temp. Control
Barber-Colman
Centralab Div.
Cole Instrument
Cook Electric
Daven Co.
Federal Anti-Capacity
Furnas Electric Co.
General Elec. Co.
General Radio Co.
J-B-L Inst. Co.
J-B-T Instruments
Kellogg Switchboard
Mallory & Co.
McDonnell & Miller
Meter Devices Co.
Micro Switch Corp.
Mossman, Inc.
Ohmite Mfg. Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shalleross Mfg.
Taco Engineering
Teleoptic Co.
Thwing-Albert Instrument
Trimount Inst. Co.
Triplett Elec. Inst. Co.
United States Inst. Corp.
Utah Radio Prods.
Westinghouse Elec.
Weston Elec. Inst. Corp.

SWITCHES, Magnetic
Allen-Bradley Co.
Allied Control Co.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Switch Co.
Automatic Temp. Control
Cook Electric
Cutler-Hammer, Inc.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
Industrial Engr. Corp.
Monitor Controller Co.
Penn Electric Switch
Perfex Corp.
Struthers-Dunn
Taco Engineering
Ward Leonard Elec. Co.
Warrick, C. F.
Westinghouse Elec.
Zenith Electric Co.

SWITCHES, Mercury
Arrow-Hart & Hegeman
Bacon Electric Timer
Continental Elec. Co.
Elec. Switch Corp.
Frederick, George
General Elec. Co.
Gen. Elec. Lamp Dept.
Hart Mfg. Co.
H-B Instrument Co.
Minneapolis-Honeywell
Rhodes, Inc.
Taco Engineering

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Carter Radio Div.
Clare & Co., C. P.
Cutler-Hammer, Inc.
Echo Electrical
General Control Co.
General Elec. Co.
Kellogg Switchboard
Mallory & Co.
Micro Switch Co.
Mossman, Inc.
Mu-Switch Corp.
Muter Co.
United States Inst. Co.
Utah Radio Prods.
Ward Leonard Elec. Co.

SWITCHES, Pyrometer
Bristol Co.
Brown Inst. Co.
Cole Instrument
Daven Co.
Foxboro Co.
J-B-L Instrument
J-B-T Insts. Inc.
Leeds & Northrup
Lewis Engg. Co.
Revere Corp.
Rowe Research Lab.
Taco Engineering
Tagliabue Div.
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
United States Inst. Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Instruments

SWITCHES, Relay
Allen-Bradley Co.
Allied Control Co.
Andrew, Victor J.
Amer. Automatic Elec.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Sales
Automatic Switch Co
Automatic Temp. Control
Betts & Betts
Clare & Co.
Cole Instrument
Cook Electric Co.
Cutler-Hammer, Inc.
Eclipse Aviation
Edison Electrical Controls
Friez & Sons
General Controls Co.
General Elec. Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
Industrial Engr. Corp.
Kellogg Switchboard
Mallory & Co.
Meter Devices Co.
Monitor Controller Co.
Penn Electric Switch
(Cont'd)

SWITCHES, Relay
(Cont'd)
Perfex Corp.
Struthers-Dunn
Taco Engineering
Ward Leonard Elec. Co.
Warrick Co.
Westinghouse Elec.
Zenith Electric Co.

SWITCHES, Rotary
Amer. Automatic Elec.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Sales
Barber-Coleman
Carter Radio Div.
Centralab Div.
Cole Instrument
Cutler-Hammer, Inc.
Daven Co.
Federal Telegraph Co.
Foxboro Co.
Furnas Electric Co.
General Control Co.
General Elec. Co.
General Radio Co.
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
J-B-L Instrument
J-B-T Insts.
Leeds & Northrup
Lewis Engg. Co.
Mallory & Co.
Meter Devices Co.
Ohmite Mfg. Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Taco Engineering
Tagliabue Div.
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
United States Inst. Corp.
Utah Radio Prods.
Westinghouse Elec.
Weston Elec. Inst. Corp.

SWITCHES, Selector
Allen-Bradley Co.
Allis-Chalmers
Automatic Elec. Sales
Carter Radio Div.
Centralab Div.
Cole Instrument
Cook Electric
Cutler-Hammer, Inc.
Daven Co.
Federal Telegraph Co.
General Elec. Co.
H-B Instrument Co.
J-B-L Instrument
Leeds & Northrup
Mallory & Co.
Meter Devices Co.
Ohmite Mfg. Co.
(Cont'd)

SWITCHES, Selector
(Cont'd)
Revere Co.
Shallcross Mfg. Co.
Taco Engineering
Thwing-Albert Inst. Co.
United States Inst. Corp.
Westinghouse Elec.

SWITCHES, Snap
Acro Electric
Allied Control Co.
Arrow-Hart & Hegeman
Automatic Temp. Control
Cutler-Hammer, Inc.
General Control Co.
General Controls
General Elec. Co.
Hart Mfg. Co.
Mallory & Co.
McDonnell & Miller
Micro Switch Corp.
Minneapolis-Honeywell
Mu-Switch Corp.
Muter Co.
Perfex Corp.
Ward Leonard Elec. Co.

SWITCHES, Snap Action
Acro Electric
Barber-Colman
Cutler-Hammer, Inc.
General Control Co.
General Controls
General Elec. Co.
Leeds & Northrup
Micro Switch
Mu-Switch Corp.
Ulanet Co., Geo.
Westinghouse Elec.

SWITCHES, Thermostatic
Advance Electric Co.
Allen-Bradley Co.
Barber-Colman
Betts & Betts
Bridgeport Thermo. Co.
Burling Instrument Co.
Cook Electric Co.
Dickson Co.
Edison Electrical Controls
Fenwal, Inc.
Friez & Sons
General Controls
Gleason-Avery, Inc.
Guardian Electric
Hart Manufacturing Co.
Micro Switch Co.
Minneapolis-Honeywell
Mu-Switch Corp.
Penn Electric Switch Co.
Perfex Corp.
Shallcross Mfg. Co.
Spencer Thermostat Co.
Struthers-Dunn
Taco Engineering
(Cont'd)

SWITCHES, Thermostatic
(Cont'd)
Tagliabue Div.
Thwing-Albert Inst.
Ulanet Co., George
Ward Leonard Electric Co.

SWITCHES, Time
American Timer Corp.
Anderson, A. & J. M.
Autocall Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Bacon Electric Timer
Barber-Colman
Betts & Betts
Cramer Co., Inc.
Cutler-Hammer, Inc.
Eagle Signal Corp.
Edison Electrical Controls
General Control Co.
General Controls
General Elec. Co.
Guardian Elec. Mfg. Co.
Haydon Co.
Industrial Engr. Corp.
Industrial Timer
International Register Co.
Landis & Gyr, Inc.
Leich Elec. Co.
Lektra Labs., Inc.
Lumenite Co.
Lux Clock Mfg. Co.
Mallory & Co.
Minneapolis-Honeywell
Paragon Electric Co.
Penn Electric Switch
Perfex Corp.
Photovolt Corp.
Richardson-Allen
Rhodes, Inc., M. H.
Samsel Time Control
Sangamo Electric Co.
States Co.
Stoelting Co., C. H.
Taco Engineering
Telechron, Inc.
Thomas Clock Co., Seth
Thompson Clock Co.
Ulanet Co., Geo.
Wadsworth Elec. Mfg. Co.
Walker-Jimieson, Inc.
Walser Automatic Timer
Ward Leonard Elec. Co.
Westinghouse Elec.
Zenith Electric Co.

SYNCHRONIZATION FORKS, Electrical (See Forks, Synchronization)

SYNCHRONOUS MOTORS (See Motors, Synchronous)

SYNCHROSCOPES
Control Corp.
Eclipse Aviation
Electric Controller
General Elec. Co.
Hickok Elec. Inst. Co.
Kollsman Inst. Co.
Millen Mfg. Co.
Roller-Smith Co.
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

TACHOGRAPHS
Amthor Testing Inst.
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Cramer & Co., Inc.
Metron Instrument
Ohmer Register Co.
Taco Engineering
Zeiss, Inc., Carl
Zernickow Co., O.

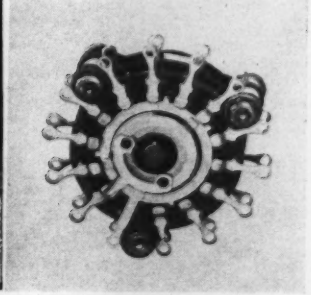
TACHOMETER TESTERS (See Testers, Tachometer)

TACHOMETERS, Centrifugal
Amthor Testing Inst. Co.
Associated Research
Barbour Stockwell Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Coats Mach. Tool Co.
Corbin Screw Corp.
Durant Mfg. Co.
Elec. Tachometer Corp.
Foxboro Co.
General Elec. Co.
Hays Corp.
Jones Motrola Sales
Kern Co.
Knopf, Paul
Kollsman Inst. Co.
Manning, Maxwell & Moore
Pioneer Instrument Co.
Scherr Co., Inc.
Stewart-Warner Corp.
Stieht & Co.
Veeder-Root, Inc.
Viking Instrument Co.
Zernickow Co., O.

TACHOMETERS, Chronometric
Amthor Testing Inst.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Coats Mach. Tool Co.
Cramer & Co., Inc.
Elec. Tachometer Corp.
Elgin Nat'l Watch Co.
Hasler-Tel Co.
Jaeger Watch Co.
Kern Co.
Pierce Watch Co.
Scherr Co., Inc.
Standard Elec. Time
Stieht & Co.
Stover-Lang Co.
Zernickow Co., O.

J-B-T

INSTRUMENT TYPE SWITCHES



Preferred by instrument and tester makers and for experimental hookups because of their compactness, rugged construction and reliability. Rigid, 3-post deck suspension, double-grip contacts, silver to silver, ball bearing indexing with beryllium copper spring, lugs staked for extra strength. 14 or 20 positions in same space generally required for 12 positions.

One to six decks, non-shorting is standard, shorting on special order. Normal carrying capacity (not make-and-break) 1 amp. Maximum momentary (not make-and-break) 5 amp. Average contact resistance .007 ohms or less. Send for switch bulletin.

Stocked by leading electronic parts distributors.

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Vibrating Reed Frequency Meters . . . Pyrometers . . . Potentiometer-Pyrometers . . . Resistance Thermometers . . . Appliance Temperature Testers . . . Thermocouples and Accessories . . . Reed Tachometers . . . Galvanometers . . . Selector Switches . . . Gas Pilot Safety Switches . . . and other Instruments and Testers.

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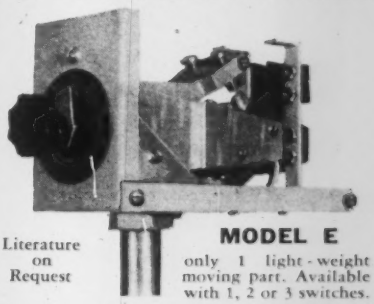
443 CHAPEL STREET • NEW HAVEN 8, CONN.

BURLING TEMPERATURE LIMIT SWITCHES

USE NO LIQUIDS . . . NO GASES



Literature on Request

MODEL E
only 1 light-weight moving part. Available with 1, 2 or 3 switches.

As a 3 switch model, Burling Model E is recommended for use (a) where load is divided into 3 parts, (b) where 1 switch is used for controlling, one as a high limit, one as a low limit, (c) to give definite stops or position to a 3 or 4 position diaphragm motor, (d) to give 3 speed control of variable speed motor.

- Accurate, Rugged, Dependable
- Corrosion and heat resisting tube
- Dial Pointer for easy setting
- Locking screw locks temperature setting
- Terminal plate has large screw terminals
- Snap-action Micro-Switch eliminates contact troubles
- Increased Adjustable range to 700-1000°
- Dimensions—7¼" x 2¾" x 3½"

MODEL V-1

For lower temperature range from 0-300°F. Available for minimum of —100° to maximum of 600°F. Usual adjustable range 50-150°, operating differential may be as small as ±¼ or as large as ±5°. Adjustable by screw and dial inside case. (Sizes 2¾" diameter × 4¼" high)

MODEL D

Adjustable range 200-500°F. Temperature range 0-1400°F. For use where temperature must be changed to suit operating conditions. Turn outside knob to change temperature setting. (Sizes 5½ x 2¾ x 2¾").

Instruments also Built to Specifications

Making Precision Controls for Over 10 Years

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251C Springfield Ave.
Newark, N. J.

Make SURE with
ASSOCIATED RESEARCH'S
VIBROGROUND

GROUND RESISTANCE TESTER

Model 255
4 Ranges

Two models meet all conditions: Model 255 4 ranges, 0-3 to 0-3000 ohms for extremes of dryness or moisture—Model 251, 3 ranges, 0-12.5 to 0-1250 ohms for average ground conditions. Safeguard from shocks, fires, explosions, by testing *true* resistance to earth, of man-made grounds. Self-contained power source. NO CRANKING. Dierct reading of resistance values. Ask for Bulletin with diagrammatic drawings.

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Engineering Service Representatives in all Principal Cities.

TACHOMETERS

TYPE "U"
UNIVERSAL CENTRIFUGAL TYPE
5 Ranges in 1 Instrument

Cat. No. 303	30-12,000 RPM
Cat. No. 314	45-18,000 RPM
Cat. No. 322	60-24,000 RPM
Cat. No. 346	120-48,000 RPM

Bulletin 750-N

MODEL J
TRIPLE RANGE CENTRIFUGAL

Cat. No. 312 300-12,000 RPM
Cat. No. 1412 100-12,000 RPM

SINGLE RANGES
100-1200 RPM, 200-2400 RPM
300-3600 RPM, 400-4800 RPM

Bulletins 760-N, 790-N

"JAQUET"
SPEED INDICATORS (CHRONOMETRIC)
Guaranteed Accuracy within ½ of 1%

Cat. No. 2301 0-10 000 RPM
Cat. No. 2302 0- 1,000 RPM

Suitable double rated speed. 3 models, various accessories.

Bulletin 735-N

STATIONARY TYPE
MODEL "J"

Sizes, 3", 4", 5½", 8", 10", and 20" dial diameter, flexible shaft driven.

Many standard ranges reading RPM, FPM, YPM, etc.

Bulletins 795-N, 796-N 797-N

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK, N. Y.

TACHOMETERS, Cross-pendulum
Amthor Testing Inst.
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Manning, Maxwell & Moore
Sticht & Co.
Zernickow Co., O.

TACHOMETERS, Electric
Airdesign & Fabrication
Anderson Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Chicago Elec. Tachometer
Clarke Inst. Corp.
Cole Instrument
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Electro Mechano Co.
Esterline-Angus Co.
Foxboro Co.
General Elec. Co.
Hastings Inst. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Hy-Ef Electrical Prods.
Instrument Lab. Inc.
Jaeger Watch Co.
J-B-T Instruments
Jones Motrola Sales
Knickerbocker Dev.
Kollsman Inst. Co.
Lantz-Phelps Corp.
Martin Decker Corp.
Metron Instruments
Moisture Register Co.
National Instrument Co.
Pioneer Instrument Co.
Pitometer Log Corp.
Potter Co.
Scherr Co., Inc.
Standard Elec. Time
Sticht Co., Inc.
Sun Electric Corp.
Taco Engineering
Waugh Labs.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.
Zip Abrasive Co.

TACHOMETERS, Electromagnetic
Chicago Elec. Tachometer
Cummings Mach. Works
Electric Auto-Lite
General Elec. Co.
Jaeger Watch Co.
Kollsman Inst. Co.
National Instrument Co.
Pioneer Instrument
Standard Elec. Time Co.
Sun Manufacturing
Stewart-Warner Corp.
Taco Engineering
Triplett Elec. Inst.
Waltham Watch
Westinghouse Elec.
Zernickow Co., O.

TACHOMETERS, Fly-ball
Biddle Co., Jas. G.
Boulin Instrument Corp.
Coats Mach. Tool Co.
Elec. Tachometer Corp.
Jones Motrola Sales
Kern Co.
Manning, Maxwell & Moore
Sticht & Co.
Viking Instrument Co.
Zernickow Co., O.

TACHOMETERS, Portable
Amthor Testing Inst. Co.
Associated Research
Biddle Co., Jas. G.
Boulin Instrument Corp.
Chicago Elec. Tachometer
Coats Mach. Tool Co.
Corbin Screw Corp.
Elec. Tachometer Corp.
Foxboro Co.
General Elec. Co.
Hasler-Tel Co.
Jones Motrola Sales
Kern Co.
Manning, Maxwell & Moore
Martindale Electric Co.
Metron Instruments
Rieker Instrument Co.
Scherr Co., Inc.
Sticht & Co.
Sun Electric Corp.
Viking Instrument Co.
Winslow Co.
Zernikow Co.

TACHOMETERS, Speed Limit Control
Askania Regulator Co.
Barbour Stockwell Co.
Bristol Co.
General Elec. Co.
Metron Instrument
Sticht Co., Inc.
Standard Elec. Time
Taco Engineering

TACHOMETERS, Stroboscopic
Boulin Instrument Corp.
Clarke Inst. Corp.
Coats Mach. Tool
General Radio Co.
L. A. B. Corp.
Stewart-Warner Corp.

TACHOMETERS, Tilting-ring
Amthor Testing Inst. Co.
Coats Mach. Tool Co.
Kern Co.
Zernikow Co.

TACHOMETERS, Vibrating Reed
Biddle Co., Jas. G.
J-B-T Instruments

TACHOSCOPES
Amthor Testing Inst. Co.
Biddle Co., Jas. G.
Coats Mach. Tool Co.
Metron Instruments
Scherr Co., Inc.
Sticht & Co.
Taco Engineering
Zernickow Co., O.

TAFFRAIL LOGS; SHIP
Bliss & Co.

TANGENT METERS (See Meters, Tangent)

TAPE STRETCHER APPARATUS
Ballauf Mfg. Co.

TAPES, Oil Gauger's
Dietzgen Co.
Keuffel & Esser Co.
Lufkin Rule
Starrett Co.

TAPES, Steel
Bruning Co., Inc.
Dietzgen Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Soltmann, Inc.
Speidel & Co.
Starrett Co.
United States Blue Print
Warren-Knight Co.
Weber Co.
White Co. Inc.

TAPES, Surveyor's (See Surveying Instruments)

TAPES, Woven
General Elec. Co.
Lufkin Rule Co.

TAXI METERS
Knopf, Paul
Ohmer Corp.
Pittsburgh Taximeter Co.

TELEMETERING SYSTEMS (See Remote Metering)

TELEMETERS (Surveying & Military—Optical)
Kern Co.
Kollmorgen Optical Co.
Keuffel & Esser Co.
Pierce Watch Co.

TELESCOPES, Alignment
Acme Industrial
Am. Telescope Labs.
Fecker, J. W.
Gaertner Scientific
Gen. Engg. & Model
Keuffel & Esser Co.
Kollmorgen Optical Co.
Mogey & Sons
Perkin-Elmer Corp.
Ruska & Co.
Scherr Co., Inc.
Tinsley Laboratories
Unertl, John
White Co. Inc.

TELESCOPES, Astronomical
Am. Telescope Labs.
Bausch & Lomb Opt.
Clark & Sons
Eastern Science Co.
Fecker, J. W.
Gaertner Scientific Corp.
Henson Co., Fred C.
Kern Co.
Mico Instrument Co.
Mogey & Sons
Perkin-Elmer Corp.
Tinsley Labs.
Unertl, John
White Co.
Zeiss, Inc., Carl

TELESCOPES, Azimuth
American Optical
Am. Telescope Labs.
Clark & Sons
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Kollmorgen Optical Co.
Mogey & Sons
Perkin-Elmer Corp.
Tinsley Labs.
Unertl, John
Warren-Knight Co.
Warner & Swasey Co.
White Co.
Zeiss, Inc., Carl

TELESCOPES, Bore & Internal Surface, Inspection
American Cystoscope
American Optical
Am. Telescope Labs.
Fecker, J. W.
Gaertner Scientific
Gauthier, Donat A.
Gen. Engg. & Model Wks.
Kollmorgen Optical Co.
Leitz, Inc.
Lenox Inst. Co.
Perkin-Elmer Corp.
Scherr Co., Inc.
Standard Gage
Unertl, John
Zeiss, Inc., Carl

TELESCOPES, Laboratory
American Optical
Eberbach & Son
Gaertner Scientific Corp.
Henson Co., Fred C.
Mogey & Sons
Ruska & Co.
Tinsley Laboratories

TELESCOPES, Reflecting
Am. Telescope Labs.
Clark & Sons
Fecker, J. W.
Fish-Schurman Co.
Henson Co., Fred C.
Mogey & Sons
Perkin-Elmer Corp.
Tinsley Labs.
Unertl, John
Warner & Swasey Co.
Zeiss, Inc., Carl

TELESCOPES, Refracting
Am. Telescope Labs.
Bausch & Lomb Opt.
Clark & Sons
Fish-Schurman Co.
Fecker, J. W.
Henson Co., Fred C.
Keuffel & Esser Co.
Kern Co.
Mogey & Sons
Perkin-Elmer Corp.
Tinsley Labs.
Unertl Optical Co.
Warner & Swasey Co.
Wollensak Optical Co.
Zeiss, Inc., Carl

TELESCOPES, Zenith
Am. Telescope Labs.
Clark & Sons
Fecker, J. W.
Gaertner Scientific Corp.
Kern Co.
Mogey & Sons
Perkin-Elmer Corp.
Unertl, John
Zeiss, Inc., Carl

TENSIOMETERS
Baldwin Southwark
Boulin Instrument Corp.
Central Scientific Co.
Dillon & Co.
Geophysical Inst. Co.
Metron Instrument
Millers Falls
Olsen Testing Machine
Suter, Alfred
Thwing-Albert
Toledo Scale Co.

TENSION INDICATORS
Dillon & Co.
General Elec. Co.
Geophysical Inst. Co.
Martin Decker Corp.
Pacific Scientific Co.
Precision Scientific
Roederer-Kohlbusch, Inc.
Taco Engineering

TENSION INDICATORS, Textile
Boulin Instrument Corp.
Dillon & Co.
Federal Products Corp.
General Elec. Co.
Statham Labs.
Taco Engineering
Waugh Labs.

TEST BLOCKS
Detroit Testing Mach.
Eitzen Co.
Ford Motor Co.
General Elec. Co.
Meter Devices Co.
Steel City Testing Lab.
Van Keuren Co.

TEST BLOCKS Textile
Boulin Instrument Corp.

TEST INDICATOR
Deming Indicator Co.
Federal Products Corp.
Reich Mfg. Co.
Scherr Co., Inc.
Starrett Co.
Taco Engineering

TEST STANDS, Propeller
Airplane Mfg. & Supply

TEST WEIGHTS (See Weights, Test)

TEST WELLS
Jerguson Gage & Valve
Palmer Co.
Tagliabue Div.
Taylor Inst. Co.
Waltham Dial Gage

TESTERS, Altimeter
Meriam Co.

TESTERS, Bearing
Elgin National Watch
Physicists Research

TESTERS, Mica
Boonton Radio Corp.

TESTERS, Non destructive electrical for physical properties
Cady & Co.
Ferner Co.
Magnaflux Corp.
Sperry Products
Taco Engineering
Waugh Labs.

TESTERS, Radio Tube See Analyzers, Radio Set

TESTERS, Tachometer
American Time Prods.
Amthor Testing Inst.
Biddle Co., Jas. G.
Consol. Ashcroft Hancock
Elec. Tachometer Corp.
General Elec. Co.
Globe Industries
Hayward, H. N.
Ideal Lab. Tool
Pioneer Instrument
Precision Scientific
Rieker Inst. Co.
(Cont'd)

TESTERS, Tachometer (Cont'd)
Rowe Radio Research
Standard Elec. Time
Sticht Co., Inc.
Sun Manufacturing
Taco Engineering
Zeiss, Inc., Carl
Zernickow Co., O.

TESTERS, Thermometer
Amthor Testing Inst.
Consol. Ashcroft Hancock
Freas Glass Works
Fried & Lustig
Fuess, Inc.
G. M. Mfg. Co.
Green, Henry J.
J-B-T Instruments
Huddleston, J. S. F.
Moeller Instrument Co.
Palmer Co.
Ruehfel Co.
Schultheis Corp.
Taco Engineering
Tagliabue Div.
Thwing-Albert Inst. Co.
Wagner & Son
Weksler Thermometer

TESTERS, Torque and Torque Wrench
Sturtevant Co.

TESTERS & TESTING MACHINES (See also object of measurement and control)

TESTERS & TESTING MACHINES, Abrasion
American Inst. Co.
Amthor Testing Inst. Co.
Atlas Elec. Devices Co.
Buehler, Adolph I.
Fidelity Mach. Co.
General Elec. Co.
Morehouse Machine Co.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Shawmut Engineering Co.
Suter, Alfred
Taber Instrument Co.
Testing Machines, Inc.
Welch Engineering Co.
Zuhr, Inc., Henry

TESTERS & TESTING MACHINES, Absorption
Burrell Tech. Supply
Gurley, W. & L. E.
Precision Scientific

TESTERS & TESTING MACHINES, Air Speed Indicator (See Air-speed Indicator Testers)

TESTERS & TESTING MACHINES, Alternating Stress
Baldwin Southwark
Brush Development Co.
Krouse Testing Machine
Olsen Testing Machine
Riehle Div.
Suter, Alfred

TESTERS & TESTING MACHINES, Altimeter (See Altimeter Testers)

TESTERS & TESTING MACHINES, Armature
Associated Research, Inc.
Communication Meas. Lab.
Ideal Commutator Dresser
Instrument Labs.
Sherron Metallic

TESTERS & TESTING MACHINES, Asphalt
American Inst. Co.
Atlas Electric Devices
Brabender Corp.
Braun Corp.
Central Scientific Co.
Chatillon & Sons
Dillon & Co.
Exact Weight Scale
Fish-Schurman Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Philadelphia Thermometer
Precision Scientific Co.
Riehle Div.
Tagliabue Div.
Thwing-Albert Inst.
Victor Equipment Co.
Western Machinery Co.

TESTERS & TESTING MACHINES, Axle
Sperry Products, Inc.

TESTERS & TESTING MACHINES, Ball Bearing (See Testers, Bearing)

TESTERS & TESTING MACHINES, Battery
Assembly Products
Burton-Rogers Co.
Clough-Brengle Co.
Cole Instrument
Daven Co.
Electronic Development
Electronics, Inc.
Hickok Elec. Inst. Co.
Hy-Ef Electrical Prods.
Instrument Labs.
Kimble Glass
Knickerbocker Dev.
Lantz-Phelps Corp.
Lundquist Tool & Mfg.
M B Mfg. Co.
(Cont'd)

ELECTRICAL TACHOMETERS

Quickly installed simply by wiring indicator to magneto. Indicators can be calibrated in RPM or other units. Several indicators can be connected to one magneto and mounted wherever desired. Widely used on pumping and conveyor systems, ovens, kilns, etc. Weston Electrical Instrument Corporation, 591 Frelinghuysen Ave., Newark 5, New Jersey.

WESTON *Instruments*

Keeps an eye on EFFICIENCY!

One sure guide to efficiency is knowing just how your machines are performing. There'll be no guesswork when you're using Corbin Industrial Tachometers!

Ruggedly built, Corbin Tachometers embody a cross-balanced, centrifugal governor . . . are sensitive without oscillation . . . positive and long lasting. They require no lubrication, and are unaffected by temperature or vibration . . . can be calibrated to RPM, tons per hour, bottles per hour, minutes drying time, sheets per minute — in short, to meet practically every industrial requirement.

Call on us for prompt, complete information on Tachometers. They are available in standard hand types, or can be engineered to meet your special requirements.

No guesswork when you use a Corbin Tachometer.

Corbin Screw Division
American Hardware Corp.
New Britain, Connecticut

PA-2

Accurate **CORBIN** *Tachometers*

The Lyons Chronometric Hand Tachometer is designed to provide exceptionally precise measurement of constant rotary and linear speeds.

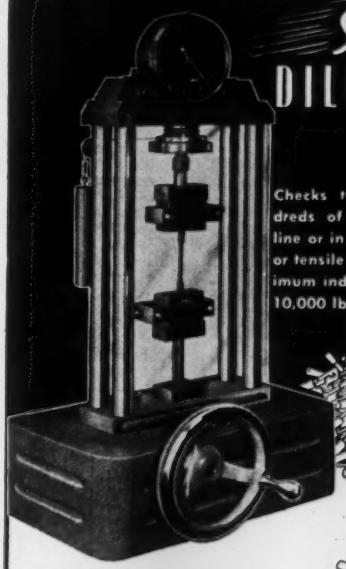
Produced in two types, 0 to 1000 RPM and 0 to 10000 RPM, graduated in 1/5 RPM and 2 RPM subdivisions respectively, the Lyons has an overspeed allowance of 100%, is durable and entirely trustworthy.

BOULIN INSTRUMENT CORPORATION

PORTABLE AND STATIONARY CENTRIFUGAL TACHOMETERS
PORTABLE CHRONOMETRIC AND STROBOSCOPIC TACHOMETERS

65 MADISON AVENUE, NEW YORK, N. Y.

SPEEDY DILLON TENSILE TESTER



Checks tensile strength of several hundreds of specimens daily on production line or in lab. For compression, transverse or tensile testing. Self aligning grips, maximum indicator, 7 different capacities up to 10,000 lbs.

Weighs only 132 lbs. Calibrated with Morehouse ring for split accuracy. Stands only 37 inches tall. Easily motorized and can be used with extensometer if desired. For rounds, flats, or special shapes. Precison built yet low in cost. Send specimen for price quotation. Delivery only 10 to 14 days! Write for illustrated 8 page folder in color.

W. C. DILLON & CO., INC. 5415 W. HARRISON STREET CHICAGO, ILLINOIS

Sturtevant
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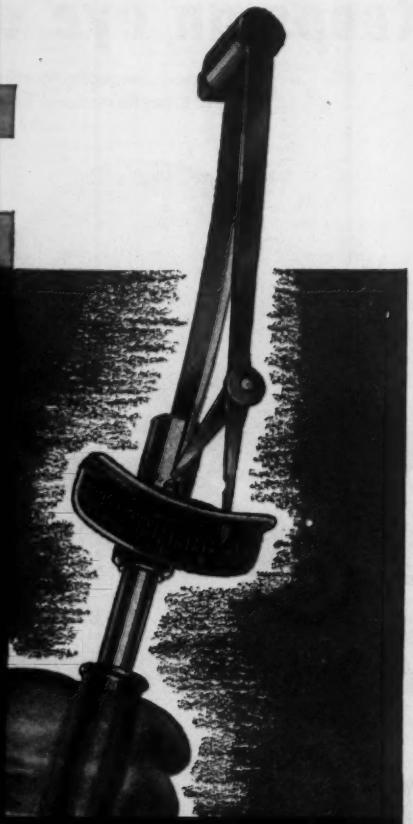

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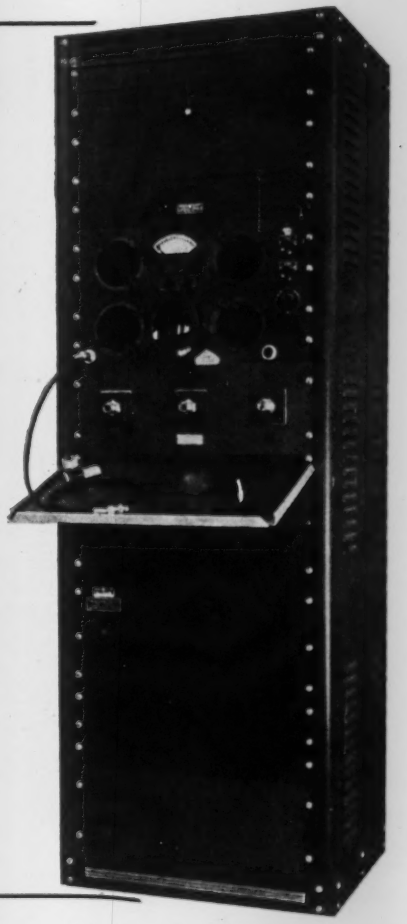

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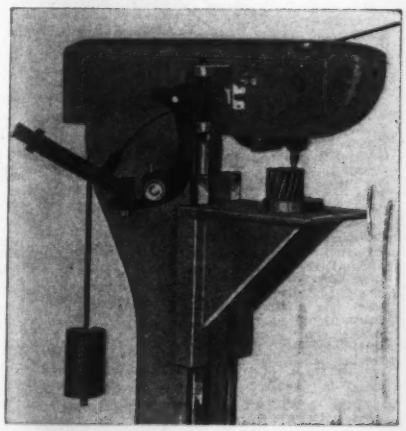

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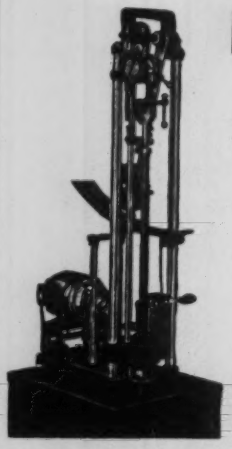

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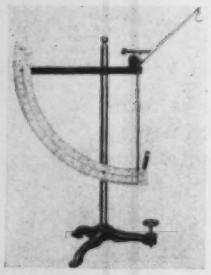

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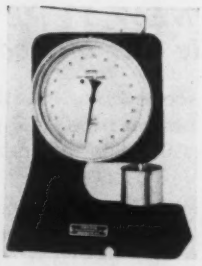

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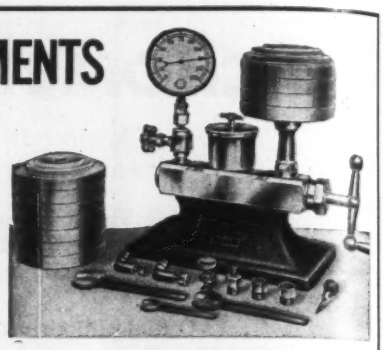

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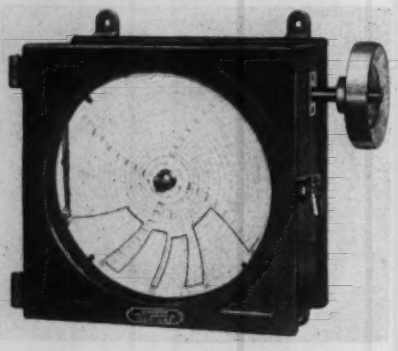

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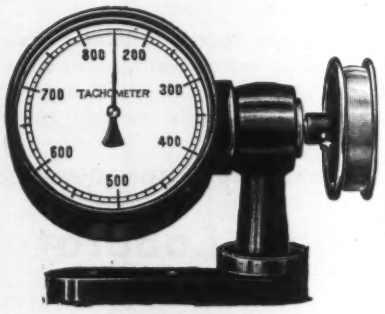

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Olsen Testing Machine

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Rieker Instrument Co.
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Photovolt Corp.
Ruehfel Co.
Saxl Instr. Co.
Scott Co., Henry L.
Taber Instrument Co.
Thermo-Electric
Van Keuren Co.
Zuhr, Inc., Henry

TESTERS & TESTING MACHINES, Paper
American Inst. Co.
Amthor Testing Inst. Co.
Atlas Elec. Devices
Bausch & Lomb
Cady & Co., E. J.
Central Scientific Co.
Dietert Co.
Dillon & Co.
Elmer & Amend
Emerson Apparatus Co.
Federal Prod. Corp.
Ferner Co.
Fuess, Inc.
General Elec. Co.
Gurley, W. & L. E.
Hart Moisture Gage
Instrument Specialties Co.
Olsen Testing Machine
Perkins & Son
Photovolt Corp.
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Speidel & Co.
Steel City Testing
Taber Instrument Co.
Thwing-Albert Inst. Co.
Toledo Scale Co.
Van Keuren Co.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Paper, Curl
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Paper Formation
Dillon & Co.
Fuess, Inc.
General Elec. Co.
Saxl Inst. Co.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Paraffin
American Inst. Co.
Perkins & Son
Precision Scientific
Ruehfel Co.
Tagliabue Div.

TESTERS & TESTING MACHINES, Penetration (Paper)
Saxl Inst. Co.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Petroleum (See Oil above)

TESTERS & TESTING MACHINES, Phosphate
Permutit Co.
Taylor & Co., W. A.

TESTERS & TESTING MACHINES, Pipe & Tube
Baldwin-Southwark Corp.
Black & Decker
Dillon & Co.
Krouse Testing Mach.
Olsen Testing Machine

TESTERS & TESTING MACHINES, Pistol Barrel Optical
Fuess, Inc.
Kollmorgen Optical Co.
Lenox Inst. Co.
Scherr Co., Inc.

TESTERS & TESTING MACHINES, Piston Ring
Amer. Measuring Insts.
Gordon Co., Claud S.
Link Engineering

TESTERS & TESTING MACHINES, Pitch
American Inst. Co.
Precision Scientific Co.

TESTERS & TESTING MACHINES, Plasticity
American Inst. Co.
Brabender Corp.
Dietert Co.
Dillon & Co.
Elmer & Amend
Humboldt Mfg. Co.
Olsen Testing Machine
Precision Scientific Co.
Saxl Inst. Co.
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Steel City Testing
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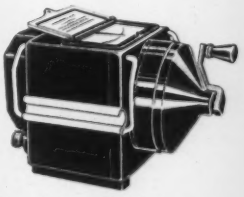
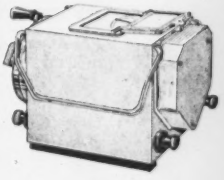


For Insulation Resistance. "Megger" Insulation Testers—Hand driven, Motor driven, "Meg," "Bridge-Meg," "Super-Meg" and Midget Types. *Catalog 1685-I*



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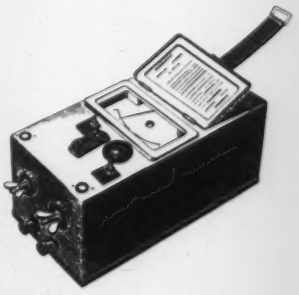

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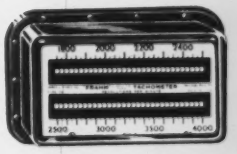

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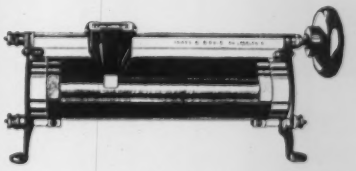

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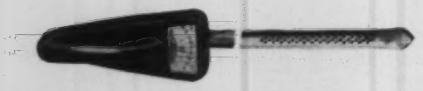

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Westinghouse Elec.
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Hart Moisture Gage
Perkins & Son
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Williams Apparatus Co.

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Communication Meas. Lab.
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Ferris Instrument Corp.
General Elec. Co.
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Sherron Metallic
Simpson Electric Co.
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Westinghouse Elec. & Mfg.
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Sperry Products, Inc.

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Associated Research, Inc.
Automatic Electric
Biddle Co., James G.
Cole Instrument
Communication Meas. Lab.
Freed Transformer
General Elec. Co.
General Radio Co.
Gray Instrument Co.
Industrial Instruments
Instrument Labs.
Leeds & Northrup Co.
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Shalleross Mfg. Co.
Supreme Instrument Corp.
Taco Engineering
Triplett Electrical Inst.
Westinghouse Elec. & Mfg.
Weston Electrical Inst.

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Dillon & Co.
Elmer & Amend
Emerson Apparatus Co.
Federal Prod. Corp.
Ferner Co.
Fish-Schurman Co.
Gordon Co., Claud S.
Instrument Specialties
Link Eng.
Morehouse Machine Co.
Olsen Testing Machine
Precision Scientific
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Shore Instrument
Suter, Alfred
Steel City Testing
Taber Inst. Corp.
Van Keuren Co.

TESTERS & TESTING MACHINES, Salt Spray
American Instrument Co.
Industrial Filter

TESTERS & TESTING MACHINES, Sand
Chatillon & Sons
Dietert Co.
Elmer & Amend
Exact Weight Scale Co.
Hart Moisture Gage
Humboldt Mfg. Co.
Kolesch & Company

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Dietert Co.
Saxl Inst. Co.
Spencer Lens Co.
Steel City Testing
Taber Instrument Co.
Testing Machines, Inc.
Zuhr, Inc., Henry

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Dillon & Co.
Ferner Co.
Humboldt Mfg. Co.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Suter, Alfred

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Bock Machine Co.
Buehler, Adolph I.
Detroit Testing Mach.
Dillon & Co.
Krouse Testing Machine
Olsen Testing Machine
Riehle Div.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Taber Instrument Co.

TESTERS & TESTING MACHINES, Slowness
Saxl Inst. Co.
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS & TESTING MACHINES, Softness
Dillon & Co.
Ferner Co.
Gurley, W. & L. E.
Humboldt Mfg. Co.
Precision Scientific
Saxl Inst. Co.
Taber Instrument Co.
Thwing-Albert Inst. Co.

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Chatillon & Sons
Coats Mach. Tool Co.
Detroit Testing Mach.
Dillon & Co.
Exact Weight Scale
Federal Products Corp.
Gordon Co., Claud S.
Instrument Specialties Co.
Link Engineering
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Skyway Prec. Tool
Steel City Testing Lab.
Sturtevant Co.
Suter, Alfred
Toledo Scale Co.

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Dillon & Co.
Ferner Co.
Fuess, Inc.
Olsen Testing Machine
Saxl Inst. Co.
Taber Instrument Co.
Taco Engineering
Thwing-Albert Inst. Co.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Stiffness & Bending
Dillon & Co.
Ferner Co.
General Elec. Co.
Instrument Specialties
Krouse Testing Mach.
Olsen Testing Machine
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TESTERS & TESTING MACHINES, Stiffness & Bending (Cont'd)
Precision Scientific
Riehle Div.
Saxl Inst. Co.
Suter, Alfred
Taber Instrument Co.
Taco Engineering
Thwing-Albert Inst. Co.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Strain (Glass)
Akston, Inc.
Baird Associates
Bausch & Lomb Opt.
Elmer & Amend
Fecker, J. W.
Fish-Schurman Corp.
Fuess, Inc.
Gaertner Scientific Corp.
General Elec. Co.
Kollmorgen Optical Co.
Pfaltz & Bauer, Inc.
Plummer & Kershaw
Polarising Instrument Co.
Precision Scientific
Taco Engineering
Zeiss, Inc., Carl

TESTERS & TESTING MACHINES, Stretch
Amthor Testing Inst. Co.
Dillon & Co.
Link Engineering
Perkins & Son
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Taco Engineering
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Tearing-Paper
General Elec. Co.
Saxl Inst. Co.
Scott Co., Henry L.
Speidel & Co.
Taco Engineering
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Tenderness
American Inst. Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Saxl Inst. Co.

TESTERS & TESTING MACHINES, Textile
American Inst. Co.
Atlas Elec. Devices Co.
Dillon & Co.
Emerson Apparatus Co.
Hart Moisture Gage
Perkins & Son
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Taber Instrument Co.
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Thread
Beulin Instrument Corp.
Dillon & Co.
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Torsion
Baldwin-Southwark Corp.
Beulin Instrument Corp.
Consolidated Engg.
Detroit Testing Mach.
Exact Weight Scale
Hathaway Inst. Co.
Hayes Scientific App.
Krouse Testing Mach.
Metron Instrument
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Steel City Testing
Suter, Alfred
Testing Machines, Inc.
Toledo Scale Co.
Waugh Laboratories

TESTERS & TESTING MACHINES, Torsional Creep
Baldwin-Southwark Corp.
Suter, Alfred
Taco Engineering

TESTERS & TESTING MACHINES, Turn Indicator
Amthor Testing Inst. Co.
Globe Industries
(Cont'd)

TESTERS & TESTING MACHINES, Turn Indicator (Cont'd)
Ideal Lab. Tool
Pioneer Instrument
Rieker Instrument Co.
Rushfel Co.
Taco Engineering

TESTERS & TESTING MACHINES, Universal (See Testing Machines, below)

TESTERS & TESTING MACHINES, Vapor Transmission
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Varnish
Atlas Elec. Devices Co.
Dillon & Co.
Elmer & Amend
Fish-Schurman Co.
Hellige, Inc.
Photovolt Corp.
Taber Instrument Co.
Thermo-Electric Co.
Zuhr, Inc., Henry

TESTERS & TESTING MACHINES, Vibration
All Amer. Tool & Mfg.
Associated Research
Brush Development Co.
Consolidated Engineering
Electro Products Lab.
Ferner Co.
General Elec. Co.
Hathaway Instrument
Holland Research
Krouse Testing Machine
Kurman Electric Co.
L.A.B. Corp.
RCA Manufacturing
Televiso Products
Waugh Labs.
Westinghouse Elec.

TESTERS & TESTING MACHINES, Voltage
American Radio Co.
Associated Research
Clough-Brengle Co.
Cole Instrument
Electronic Development
General Elec. Co.
Ideal Commutator
Instrument Labs.
MacLeod & Hanopol
Norton Electrical Inst.
Precision Apparatus
Potter Co.
RCA Manufacturing
Shalleross Mfg. Co.
Sherron Metallic
Taco Engineering
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

TESTERS & TESTING MACHINES, Watch Rate
American Time Prods.
Paulson & Co.
Taco Engineering

TESTERS & TESTING MACHINES, Water Meter
Badger Meter Co.
Exact Weight Scale
Fischer & Porter
Neptune Meter Co.
Toledo Scale Co.

TESTERS & TESTING MACHINES, Water Penetration
Biddle Co., Jas. G.
Hart Moisture Gage
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Watthour Meter
Eastern Specialty Co.
Elec. Facilities Inc.
General Elec. Co.
Hathaway Inst. Co.
Sangamo Electric Co.
Standard Elec. Time
States Co.
Western Electro-Mech.
Westinghouse Elec.

TESTERS & TESTING MACHINES, Weathering
Atlas Elec. Devices Co.
Gen. Elec. Lamp. Dept.
National Carbon Co.
Precision Scientific

TESTERS & TESTING MACHINES, Wire
Amthor Testing Inst. Co.
Baldwin-Southwark Corp.
Buehler, Adolph I.
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TESTERS & TESTING MACHINES, Wire (Cont'd)
Dillon & Co.
General Elec. Co.
Krouse Testing Mach.
Morehouse Mach. Co.
Olsen Testing Machine
Riehle Div.
Rubicon Co.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Taber Instrument Co.
Taco Engineering
Thwing-Albert Inst. Co.

TESTERS & TESTING MACHINES, Yarn
Atlas Elec. Devices Co.
Brown Inst. Co.
Dillon & Co.
Emerson Apparatus Co.
Hart Moisture Gage
Saxl Inst. Co.
Scott Co., Henry L.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTING INSTRUMENTS, OPTICAL
Acme Industrial
American Optical
Am. Telescope Labs.
Bausch & Lomb Optical
Buehler, Adolph I.
Ferner Co.
Fish-Schurman Corp.
Fuess, Inc.
Gaertner Scientific Corp.
Geophysical Inst. Co.
Jones & Lamson Machine
Kollmorgen Optical Co.
Larrimore Sales
Leitz, Inc.
Mogey & Sons
Optron Laboratory
Perkin-Elmer Corp.
Precision Scientific
Pyrometer Inst. Co.
Ruska & Co.
Woermann-Schuchhardt

TESTING MACHINES UNIVERSAL, Dead weight beam, Capacities 0-100 lb.
Buehler, Adolph I.
Dietert Co.
Gordon Co., Claud S.
Olsen Testing Machine
Refinery Supply
Saxl Inst. Co.
Thwing-Albert Inst.

TESTING MACHINES, UNIVERSAL, Dead Weight Beam, Capacities 100-5000 lb.
Buehler, Adolph I.
Gordon Co., Claud S.
Olsen Testing Machine
Refinery Supply
Riehle Div.
Thwing-Albert Inst.

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities 5000-100,000 lb.
Buehler, Adolph I.
Gordon Co., Claud S.
Olsen Testing Machine
Riehle Div.

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities over 100,000 lb.
Baldwin-Southwark Corp.
Buehler, Adolph I.
Gordon Co., Claud S.
Olsen Testing Machine
Riehle Div.

TESTING MACHINES, Universal, Hydraulic, Capacities 0-100 lb.
Buehler, Adolph I.
Dietert Co., Harry W.
Gordon Co., Claud S.
Saxl Instrument Co., Inc.
Steel City Testing Lab.
Thwing-Albert Instrument

TESTING MACHINES, Universal, Hydraulic, Capacities 100-5000 lb.
Ashton Valve Co.
Baldwin-Southwark Corp.
Buehler, Adolph I.
Detroit Testing Machine
Dietert Co., Harry W.
Emery Co.
Ferner Co.
(Cont'd)

TESTING MACHINES, Universal (Cont'd)
Gordon Co., Claud S.
Detroit Testing Machine
Riehle Div.
Steel City Testing Lab.
Saxl Instrument Co.
Steel City Testing Lab.

TESTING MACHINES, Universal, Hydraulic, Capacities 5000-100,000 lb.
Buehler, Adolph I.
Riehle Div.
Baldwin-Southwark Corp.
Detroit Testing Mach.
Gordon Co., Claud S.
Pittsburgh Instrument
Steel City Testing Lab.
Wroble Engineering Co.

TESTING MACHINES, Universal, Hydraulic, Capacities over 100,000 lb.
Baldwin-Southwark Corp.
Buehler, Adolph I.
Gordon Co., Claud S.
Riehle Div.

TESTING MACHINES, UNIVERSAL Pendulum, Capacities 0-100 lb.
Amthor Testing Inst. Co.
Dietert Co.
Buehler, Adolph I.
Dillon & Co.
Gordon Co., Claud S.
Olsen Testing Machine
Riehle Div.
Saxl Inst. Co.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Thwing-Albert Inst. Co.

TESTING MACHINES, UNIVERSAL, Pendulum, Capacities 100-5000 lb.
Amthor Testing Inst. Co.
Buehler, Adolph I.
Dietert Co.
Gordon Co., Claud S.
Olsen Testing Machine
Riehle Div.
Scott Co., Henry L.
Steel City Testing
Suter, Alfred
Testing Machines, Inc.

TESTING MACHINES, UNIVERSAL, Pendulum, Capacities 5000-100,000 lb.
Buehler, Adolph I.
Gordon Co., Claud S.
Olsen Testing Machine
Riehle Div.
Steel City Testing
Suter, Alfred

TESTING MACHINES, UNIVERSAL, Pendulum, Capacities over 100,000 lb.
Buehler, Adolph I.
Gordon Co., Claud S.
Olsen Testing Machine
Riehle Div.
Steel City Testing
Suter, Alfred

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 0-100 lb.
Baldwin-Southwark Corp.
Buehler, Adolph I.
Chatillon & Sons
Gordon Co., Claud S.
Saxl Inst. Co.
Scott Co., Henry L.
Stoelting Co., C. H.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 100-5000 lb.
Baldwin-Southwark Corp.
Buehler, Adolph I.
Dillon & Co.
Dietert Co.
Derr-Patterson Eng.
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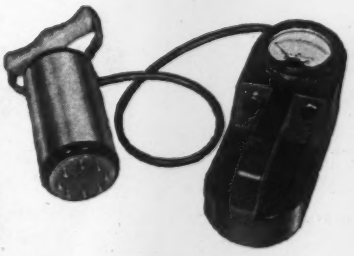

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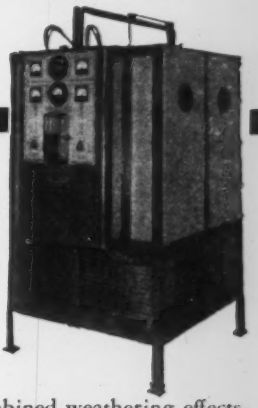

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Faithfully duplicates the combined weathering effects of sunlight, rain, heavy dew and thermal shock; accelerated to reduce years of actual weathering to a few days of testing.

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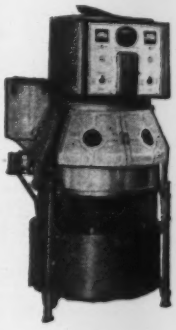
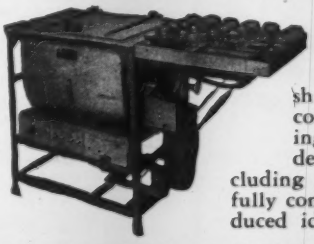
The Atlas Weather-Ometer proves the durability of materials under exact conditions of weathering found in actual use in outdoor exposure.

ATLAS FADE-OMETER



The recognized standard testing machine for determining the fastness to light of any material or finishes. Specimens are rotated around the Atlas Enclosed Violet Arc — the closest approach to natural sunlight —in masked holders. Automatic temperature control to within ±3° F. and humidity regulated by a constant reservoir according to requirements of tests. Operation is completely automatic without attention from operator; can be left in continuous operation overnight.

ATLAS LAUNDER-OMETER



Standard laboratory washing machine of A.A.T.C.C. Tests washing action, textile shrinking, staining, and color fastness to dry cleaning solvents, soaps and detergents. All factors, including washing action, carefully controlled—can be reproduced identically at any time.

Sales Representatives in Principal Cities All Over the World

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361 West Superior Street, Chicago 10, Illinois

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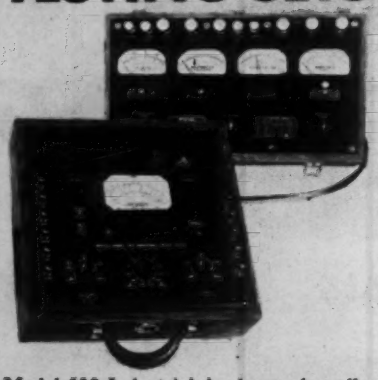
TESTING SETS



Model 639 Industrial Analyzer—has all interconnections made. Measures current, voltage and power in single or polyphase circuits, and power factor in 3 phase circuits.

Model 785 Circuit Tester—has 27 ranges for voltage, current and resistance measurements wherever high sensitivity is a factor, including signal, control, and electronic circuits.

Other tests sets available for specialized needs. Weston Electrical Instrument Corporation, 591 Frelinghuysen Avenue, Newark 5, N. J.

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TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 5000-100,000 lb.
Baldwin-Southwark Corp.
Buehler, Adolph I.
Gordon Co., Claud S.
Richle Div.
Scott Co., Henry L.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometer, Capacities over 100,000 lb.
Baldwin-Southwark Corp.
Buehler, Adolph I.
Gordon Co., Claud S.
Toledo Scale Co.

TESTING SERVICES
Clarke Inst. Corp.
Krouse Testing Mach.
Waugh Labs.

TESTING SETS (See also object of measurement and control)

TESTING SETS, Alcohol
G. M. Mfg. Co., Inc.
Precision Therm.
Rascher & Betzold
Ruehfel Co.
Scientific Glass App.
Tagliabue Div.
Weksler Thermometer

TESTING SETS, Automotive
Clough-Brengle Co.
Cole Instrument
Engelhard, Chas.
Gow-Mac Instrument
Hays Corp.
Hy-Ef Electrical Prod.
Niehoff & Co.
Potter Co.

TESTING SETS, Cable
Automatic Elec. Sales
Cole Instrument
Communication Meas. Lab.
Eastern Specialty
General Elec. Co.
General Radio Co.
Leeds & Northrup
Littelfuse, Inc.
Shallcross Mfg.
Sherron Metallic
Western Electru-Mech.
Westinghouse Elec.

TESTING SETS, Communication Circuits
Automatic Elec. Sales
Bell & Howell
Clough-Brengle
Cole Instrument
Daven Co.
Electro Products Labs.
Freed Transformer
Hewlett-Packard
Leeds & Northrup
Littelfuse, Inc.
Radio City Products
Reiner Electronics
Shallcross Mfg.
Taco Engineering
Televiso Products
United Transformer Corp.

TESTING SETS, Current Transformer
Assembly Products
Eastern Specialty Co.
Elec. Facilities Inc.
Federal Telegraph Co.
Leeds & Northrup
Rubicon Co.
States Co.
Thordarson Elec. Mfg.
West. Electro-Mechanical

TESTING SETS, Electrical
American Automatic Elec.
American Transformer
Associated Research
Automatic Elec. Sales
Clarke Inst. Corp.
Clough-Brengle Co.
Cole Instrument
Columbia Elec. Mfg.
Communication Meas. Lab.
Dayton Acme Co.
Elec. Facilities, Inc.
Electronic Development
Espey Mfg.
General Elec. Co.
Hewlett-Packard
Industrial Inst. Inc.
Meter Devices Co.
Precision Apparatus
Rawson Elec. Inst. Co.
RCA Manufacturing Co.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Sticht Co., Inc.
Superior Electric Co.
Taco Engineering
Tobe Deutschmann Corp.
Triplett Elec. Inst.
Umco Mfg. Co.
West. Electro-Mechanical
Westinghouse Elec.
Weston Elec. Inst. Corp.

TESTING SETS, Electrical Thermometer
Brown Inst. Co.
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic
Taco Engineering
Tagliabue Div.
Thwing-Albert Instrument

TESTING SETS, Ground Resistance
Am. Automatic Electric
Associated Research
Biddle Co., Jas. G.
Geophysical Inst. Co.
Holland Research
Industrial Inst., Inc.
Niagara Elec. Inst.
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg.
Sherron Metallic
Sticht Co., Inc.
Taco Engineering
Thwing-Albert Inst. Co.

TESTING SETS, Insulation
American Transformer Co.
Associated Research, Inc.
Automatic Electric
Biddle Co., James G.
Clough Brengle Co.
Cole Instrument
Ferranti Electric, Inc.
Freed Transformer
General Electric Co.
General Radio Co.
Hewlett-Packard
Hickok Electrical Inst.
Ideal Commutator Dresser
Industrial Instruments
J B L Instrument Co.
Leeds & Northrup Co.
Miller Co., B. F.
Radio City Products
Reiner Electronics
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic
Sticht Co., Inc.
Taco Engineering
Thordarson Elec. Mfg.
Triplett Elec. Inst.
Westinghouse Elec.
Weston Electrical Inst.
Winslow Co.

TESTING SETS, Line Current
Associated Research
Cole Instrument
Columbia Elec. Mfg.
Elec. Facilities, Inc.
Electronic Development
General Elec. Co.
Meter Devices Co.
Roller-Smith Co.
Rubicon Co.
Sherron Metallic
Taco Engineering
Triplett Elec. Inst.
Umco Mfg. Co.
West. Electro-Mechanical
Weston Elec. Inst. Corp.

TESTING SETS, Meters, Electrical
Associated Research
Booth Co., Arthur H.
Chicago Indust. Inst.
Clippard Inst. Lab.
Cole Instrument
Clough-Brengle Co.
Eastern Specialty Co.
Elec. Facilities, Inc.
Electronic Development
Electronics, Inc.
Espey Mfg.
General Elec. Co.
Hathaway Instrument
Hewlett-Packard
Radio City Products
Rawson Elec. Inst. Co.
RCA Manufacturing Co.
Reiner Electronics
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
States Co.
Sticht Co., Inc.
Taco Engineering
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

TESTING SETS, Meters, Fluid
American Meter Co.
Bailey Meter Co.
Tagliabue Div.

TESTING SETS, Portable Combustion
Cole Instrument
Dwyer Mfg. Co.
Engelhard, Chas.

TESTING SETS, Potential transformer
Eastern Specialty Co.
Elec. Facilities, Inc.
Leeds & Northrup Co.
Raytheon Mfg. Co.
Sherron Metallic

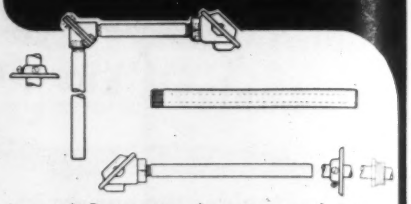
TESTING SETS, Surface Roughness
Surface Checking Gage

TESTING SETS, Telephone
Am. Automatic Electric
Automatic Elec. Sales
Daven Co.
Electronic Development
Federal Telegraph Co.
Kellogg Switchboard
Shallcross Mfg. Co.
Sherron Metallic

TESTING SETS, Water
Barnstead Still
Burrell Technical Supply
Industrial Inst., Inc.
Scientific Glass App.

TESTING SIEVE SHAKER
See Sieve Shakers

BROWN
THERMOCOUPLES
LEADWIRE AND
PYROMETER SUPPLIES



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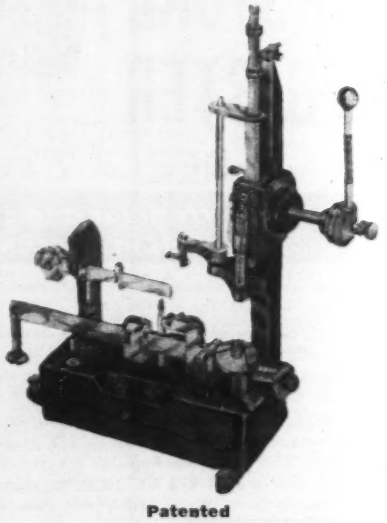

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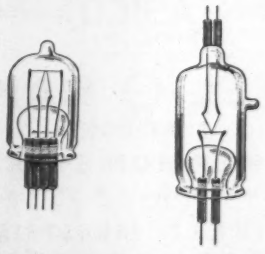

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See Sieves, Testing

THEODOLITES (See Surveying Instruments)

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THERMO - AMMETERS (See Ammeters, Thermo)

THERMOCOUPLES, Base-Metal
Bailey Meter Co.
Bacharach Industrial Inst.
Bristol Co.
Brown Inst. Co.
Cambridge Inst. Co.
Campbell Co., J. A.
Cole Instrument
De Jur-Amsco
Elematic Equip. Corp.
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Foxboro Co.
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General Elec. Co.
Gordon Co., Claud S.
Hoskins Mfg. Co.
Ill. Testing Labs.
J-B-T Insts. Inc.
Leeds & Northrup
Lewis Engg. Co.
Pyrometer Service Co.
Revere Corp.
Richards Co., Inc.
Thermo-Elec. Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Thwing-Albert Instrument
Westinghouse Elec.
Wheatstone Corp.
Wheelco Inst. Co.
Winslow Co.

THERMOCOUPLES, Contact Type
Amer. Thermo-Elec.
Bailey Meter Co.
Bristol Co.
Cambridge Inst. Co.
Campbell Co., J. A.
Cole Instrument
De Jur-Amsco
Elematic Equip. Corp.
General Controls Co.
Gordon Co., Claud S.
Hickok Elec. Inst. Co.
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J-B-T Instruments

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THERMOCOUPLES

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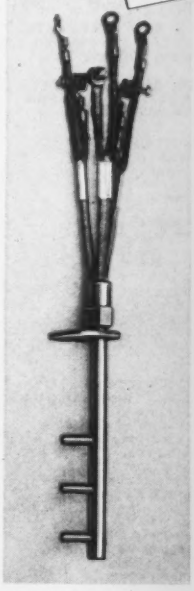

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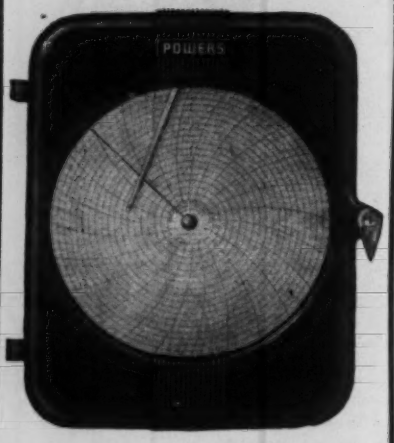
POWERS

Indicating and Recording THERMOMETERS

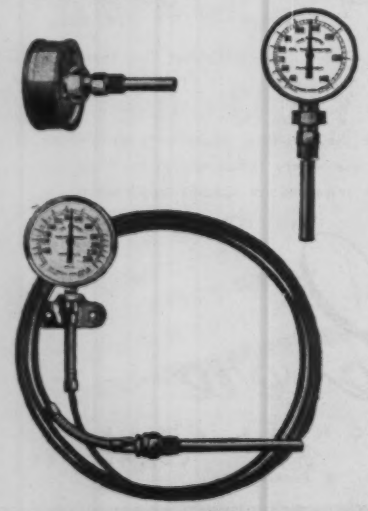


—are manufactured with the highest standard of precision to insure accurate and dependable performance. Recording Thermometers are available in single and two pen models for recording one or two different or related temperatures within the limits of **—100°F. to + 1000°F.** Many convenient chart ranges are available. Large 12" diameter charts give maximum readability.

Powers Dial Indicating Thermometers have large, easy to read dials with vertical, horizontal and remote type bulbs and are available in a variety of temperature ranges.

Temperature Controllers combined with Indicating Thermometers are available with either self-operating or air operated regulators.

Recording Controllers for temperature, humidity or pressure are also available. **Phone or write our nearest office for Bulletins.**



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THERMOCOUPLES, Contact Type (Cont'd)
Lewis Engg. Co.
Pyrometer Service Co.
Revere Corp.
Rowe Radio Research
Sensitive Research Inst.
Taco Engineering
Tagliabue Div.
Thermo-Electric Co.
Thwing-Albert Instrument
Wheelco Inst. Co.
Winslow Co.

THERMOCOUPLES, Rare-metal (See Base Metal above)

THERMOCOUPLES, Separate Heater Type
Amer. Thermo-Elec.
Campbell Co., J. A.
Cole Instrument
General Controls
General Radio Co.
Sensitive Research Inst
Taco Engineering
Wheelco Insts. Co.

THERMOCOUPLES, Vacuum
Amer. Thermo-Elec.
Ballantine Labs.
Cambridge Inst. Co.
Cole Instrument
Field Electric
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
National Research
Rawson Elec. Inst. Co.
Sensitive Research Inst.
Taco Engineering
Western Electric
Wheelco Insts. Co.
Xervac Inst. Co.

THERMO-HYDROMETERS (See Hydrometers, Thermo)

THERMOMETER TESTERS (See Testers, Thermometer)

THERMOMETER TEST WELLS
Campbell Co., J. A.
Equipoise Controls
Freas Glass Works
Gotham Inst. Co.
H-B Instrument Co.
Jerguson Gage & Valve
Manning, Maxwell & Moore
Moeller Inst. Co.
Palmer Co.
Refinery Supply
Taco Engineering
Trerice Co.
Trinity Equipment
Weksler Thermometer

THERMOMETERS, Indicating, Electrical Resistance
Am. Temperature Ind.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Cole Instrument
De Jur-Amsco Corp.
Edison Electrical Controls
Electric Auto-Lite
Engelhard, Chas.
Foxboro Co.
Fried & Lustig
General Controls
General Elec. Co.
Gordon Co., Claud S.
Gow-Mac Instrument
G-M Labs.
Ill. Testing Labs.
J-B-T Instr. Inc.
Leeds & Northrup Co.
Manning, Maxwell & Moore
Reiter-Smith Co.
Rubicon Co.
Shallcross Mfg. Co.
Stewart, M. C.
Taco Engineering
Tagliabue Div.
Thwing-Albert Instrument
Trerice Co.
Triplett Elec. Inst.
Wheelco Inst. Co.
Hays Corp.
Weston Elec. Inst. Corp.

THERMOMETERS, Indicating, Mechanical
American Temp. Ind.
Anderson Co.
Bailey Meter Co.
Bristol Co.
Dickson Co.
Dillon & Co.
Equipoise Controls
Foxboro Co.
Fuess, Inc.
G. M. Mfg. Co., Inc.
Gotham Inst.
H-B Inst. Co.
Kollsman Inst. Co.
Manning, Maxwell & Moore
Marsh Corp.
Moeller Inst. Co.
Palmer Co.
Partlow Corp.
Phila. Thermometer Co.
Refinery Supply
Republic Flow Meters
Rochester Mfg. Co.
(Cont'd)

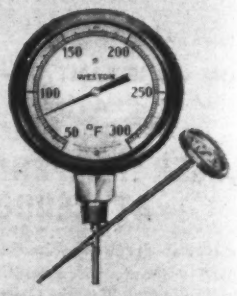
THERMOMETERS, INDICATING, Mechanical (Cont'd)
Scientific Inst. Co.
Standard Thermometer
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
U. S. Gauge Co.
Wagner & Son
Weksler Thermometer
Western Machinery Co.
Weston Elec. Inst. Corp.

THERMOMETERS, Indicating, Mercury-in-Glass, Industrial & Laboratory
Ace Glass, Inc.
Accuracy Scientific Inst.
Bristol Co.
Brooklyn Thermometer Co.
Chaslyn Co.
Consol. Ashcroft Hancock
Dillon & Co.
Fairchney Inst. Corp.
Fish-Schurman Co.
Fleischhauer & Son
Freas Glass Works
Fried & Lustig
Fuess, Inc.
G. M. Mfg. Co., Inc.
Goetz Niemer Co.
Gotham Inst. Co.
Green, Henry J.
Griebel Co.
H-B Inst. Co.
Johnson Service Co.
Kessler Co.
Kimble Glass Co.
Manning, Maxwell & Moore
Moeller Instrument Co.
Nurnberg Thermometer
Palmer Co.
Paulstich & Sons
Phila. Thermometer
Precision Scientific Co.
Precision Therm.
Rascher & Betzold
Refinery Supply
Rieker Instrument Co.
Ruehfel Co.
Scientific Glass App.
Scientific Inst. Co.
Seedburo Equipment
Seely Instrument Co., Inc.
Standard Therm. Corp.
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Wagner & Son
Weksler Thermometer
Wilder Sales Co.

THERMOMETERS, Indicating, Pressure-spring
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Dickson Co.
Fee & Stemwedel
Foxboro Co.
Gotham Instrument
Liquidometer Co., Inc.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Moeller Instrument Co.
Moore Products
Northern Engraving
Palmer Co.
Partlow Corp.
Powers Regulator Co.
Preferred Utilities Mfg.
Republic Flow Meters
Rochester Mfg. Co.
Scientific Inst. Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
United States Gauge Co.
Weksler Thermometer
Wheelco Instruments
Welch Mfg. Co.

THERMOMETERS, Indicating, Spirit-in-Glass
Accuracy Scientific
Brooklyn Thermometer Co.
Fairchney Instrument Corp.
Fee & Stemwedel
Fink-Roselieve Co.
Fleischhauer & Son
Freas Glass Works
Fried & Lustig
Friez & Sons, Julien
Gotham Inst. Co.
Green, Henry J.
Griebel Co.
H-B Instrument Co.
Huddleston, J. S. F.
Johnson Service Co.
Kessler Co.
Kimble Glass Co.
King Engineering
Manning, Maxwell & Moore
Minneapolis-Honeywell
Moeller Instrument Co.
Nurnberg Thermometer Co.
Palmer Co.
Philadelphia Thermometer
Precision Therm. & Inst.
Rutten Mfg. Co.
Scientific Instrument Co.
Scientific Glass App.
Seely Instrument Co.
Tagliabue Div.
Taylor Instrument Cos.
Trerice Co., H. O.
Weksler Thermometer
(Cont'd)

READABLE, RUGGED ALL-METAL THERMOMETERS



Rugged, all-metal construction simplifies installation and keeps breakage at a minimum. Large gauge-type scales facilitate accurate reading. Industrial models available in straight and angle forms . . . stem lengths up to 24". The laboratory model has a 1¾" head and an 8" stem. Weston Electrical Instrument Corporation, 591 Frelinghuysen Ave., Newark 5, New Jersey.

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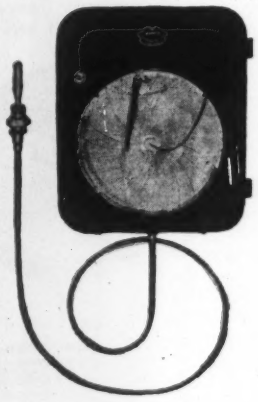
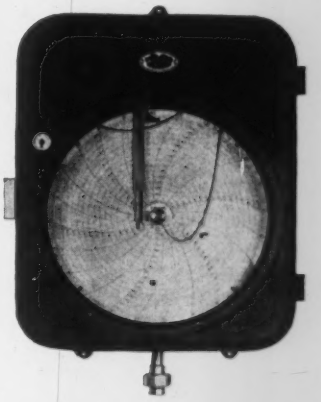
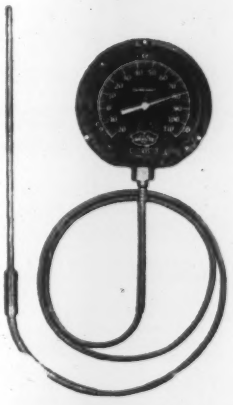


INSTRUMENTS are playing an important role in today's tremendous industrial development—especially where complicated physical or chemical processes are involved. We are proud that WEKSLER instruments—because of their known rugged construction and lasting accuracy—have been chosen for so many of these industrial applications.



Recording Thermometers (one or multiple pen) are in sturdy, cast aluminum case. Chart size: 10" or 12". Hand wound or electric clock. Mercury or vapor actuated.



Recording Gauges (single or multiple pen) in cast aluminum case, are for Pressure, Compound, Ammonia and Freon services. Supplied with 10" and 12" chart sizes—hand wound or electric clock.

Dial Indicating Thermometers, in phenolic, aluminum and brass cases, are supplied in 4½", 6" and 8½" dial sizes, mercury actuated; or 3½" and 4½" dial sizes, vapor actuated.

Dial Indicating Gauges, in molded phenol, cast aluminum and cast brass cases, are supplied in 3½", 4½", 6" and 8½" dial sizes, for all standard services.

Industrial Type Thermometers have a "V" shape bronze case, removable glass front, red reading or yellow back tube, and may be had with any desired stem.

Glass Precision Thermometers, Hydrometers, Psychrometers and Hygrometers in various scales, for many definite uses.

YOUR INQUIRIES ARE EARNESTLY SOLICITED!

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Spot or distant temperatures

American Dial thermometers have a thermostatic system entirely of metal so they may be used in places where a glass thermometer might be easily broken or would not be as accessible.

They are made for on the spot or for indicating 200 feet from the switch. Guaranteed accurate within 1% of the entire scale range.

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AMERICAN *Industrial Instruments*

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BRIDGEPORT 2, CONNECTICUT

THERMOMETERS

Bristol offers a complete line of thermometers for recording, controlling and indicating in a wide variety of temperature ranges from minus 60°F. and plus 1000°F. Many models for practically all uses include bulb-and-tubing and resistance types. Write for Bulletin T800. The Bristol Co., 113 Bristol Road, Waterbury 91, Conn.

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MARSH Dial Thermometers

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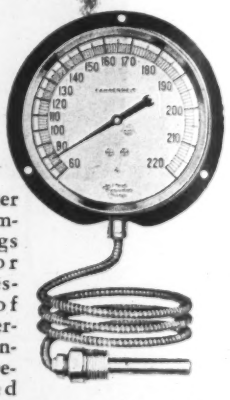
A dial thermometer that gives highly accurate temperature indication at the point of measurement. The remarkably sensitive bi-metal coil responds rapidly to any temperature. Ranges for practically all services.



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A dial thermometer that provides temperature readings from distant or otherwise inaccessible points of measurement. Operates on vapor tension and can therefore be supplied with extremely long connecting tubing. Temperature ranges for practically all services.

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Fieschhauer & Son
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Fried & Lustig
Gotham Inst. Co.
Green, Henry J.
Huddleston, J. S. F.
Manning, Maxwell & Moore
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Palmer Co.
Philadelphia Thermometer
Precision Thermometer
Rieker Instrument Co.
Schultheis Corp., E. W.
Scientific Instrument Co.
Seedburo Equipment
Taco Engineering
Tagliabue Div.
Taylor Instrument Cos.
Trerice Co., H. O.
Wagner & Son
Weksler Thermometer
Wilder Sales Co.

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Brown Inst. Co.
Consol. Ashcroft Hancock
Dickson Co.
(Cont'd)

THERMOMETERS, Portable (Cont'd)
Engelhard, Chas.
Equipoise Controls
Foxboro Co.
Friez & Sons
Gotham Inst. Co.
Green, Henry J.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Moeller Inst. Co.
Palmer Co.
Powers Regulator Co.
Practical Instrument Co.
Scientific Inst. Co.
Tagliabue Div.
Taylor Inst Cos.
Testrite Instrument Co.
Trerice Co.
Wagner & Son
Weksler Thermometer
Western Machinery Co.

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Foxboro Co.
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Gordon Co., Claud S.
Ill. Testing Labs.
Leeds & Northrup Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan
Moeller Inst. Co.
Northern Labs.
Taco Engineering
Tagliabue Div.
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Bristol Co.
Dickson Co.
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Fee & Stemwedel
Foxboro Co.
Friez & Sons
Gotham Inst. Co.
Green, Henry J.
H-B Inst. Co., Inc.
H & H Thermostats
Manning, Maxwell & Moore
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Marsh Corp.
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Moeller Instrument Co.
Palmer Co.
Partlow Corp.
Republic Flow Meters
Ryan Recording Therm.
Standard Thermometer
Taco Engineering
Tagliabue Div.
Taylor Inst. Co.
Trerice Co.
Weksler Thermometer

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Defender Automatic Reg.
Dickson Co.
Foxboro Co.
Gotham Inst. Co.
Liquidometer Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
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Moore Products
Palmer Co.
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Preferred Utilities Mfg.
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Taco Engineering
Tagliabue Div.
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Trerice Co.
Wagner & Son
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Wheelco Instruments

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Emerson Apparatus Co.
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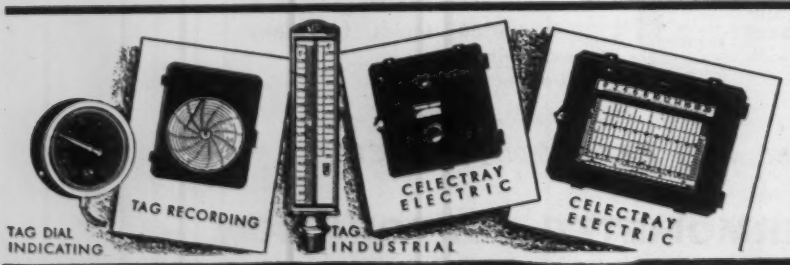

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A complete line of Indicating and Recording Instruments from the precision mercury-in-glass thermometer to the modern CELECTRAY Pyrometer for laboratory and plant service. By virtue of simple and practical design, rugged construction and precise response to the slightest temperature change within their range, TAG Thermometers are the natural choice for economical supervision of temperatures in your plant.

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Announces the publication of their new catalog in three sections.

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A copy of any or all sections will be sent you immediately upon request.

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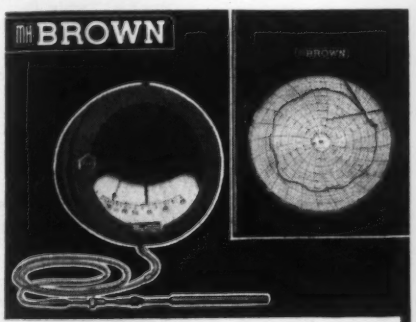
6th and Cayuga Streets Philadelphia 40, Pa.



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For Controlling, Recording and Indicating Temperatures up to 1000 F.

Charts and scales for a wide variety of ranges are available, from a minimum temperature span of 1000°F.

Recorders are furnished with a 12" or 10" diameter chart with electric or spring clock drive. Indicators are equipped with a 7½" eccentric scale. Available with vapor, gas or mercury-filled thermal systems.

CONTROL: Indicators or recorders can be furnished with "On-Off", 10% Throttling, Full Throttling, the well-known Brown Air-O-Line Control or mercury switch electric control action.

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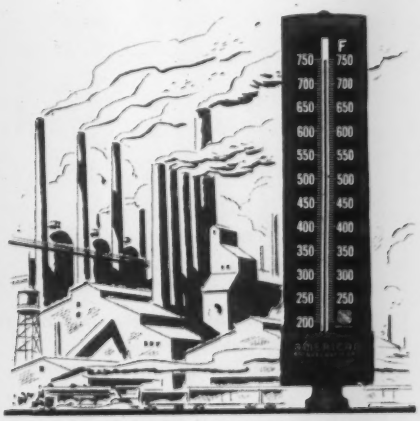
THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Co., 4482 Wayne Avenue, Philadelphia, Pa.

BROWN THERMOMETERS
AND
MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS



750°F. is hot

An American thermometer with a high reading of 750° Fahrenheit may be subjected to that temperature continuously without injury to the instrument or impairment of its accuracy.

The red-reading mercury is easy to read. Wide-angled construction, glareless glass, dust-excluding construction and corrosion-proof finish are other features. Write to us for any information.

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MANNING, MAXWELL & MOORE, INC.
BRIDGEPORT 2, CONNECTICUT

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FOR IMMEDIATE SHIPMENT

WAGLINCO IMPROVED THERMOSTATS

Waglinco's dependable new thermostats are intended for controlling the temperature of air or liquids where it is not necessary to change the operating temperature. These three new thermostats, supreme in their precision and with many improvements, are offered at prices comparable to or less than prices of older types.

Signal-Light Thermostat
(patent pend.)

Pilot light mounted on top indicates when functioning properly; when setting temp. is reached. Temperature Range: —20°F. to +500°F. Sensitivity: ±0.05°F. Each thermostat is factory set at selected temperature point.

W018—Signal-Light Thermostat, 6 inches long, $8.50.

Split-Head Thermostat
(patent pend.)

Split-head construction, with metal bands, locks studds in place—prevents breaking of platinum contacts. Range: —20°F. to +500°F. Sensitivity: ±0.05°F. When ordering, specify desired temperature setting.

W020—Split-Head Thermostat, 6 inches long, $7.00.

Lead-Wire Thermostat

A three-foot lead wire for connecting to current supply plugs into top of thermostat mounting head. Range: —20°F. to +500°F. Sensitivity: ±0.05°F. Each thermostat is factory set at temperature point you specify when ordering.

W030—Lead-Wire Thermostat, 6 inches long, $8.50.

Suitable Relays for All Thermostats Are Available—Write for Information.

Special thermostats to fill specific requirements made on order—write and tell us your problems.

WASHINGTON GLASS LABORATORY
And Instrument Company
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Palmer—originators of famous "Red-Reading-Mercury" are first again with a sensational new Thermometer. This new Thermometer features an Extruded Brass Case with V-shape design, patented by PALMER. The case is fume-resistant, dust-proof, and much more attractive—with pleasing contours and a durable nickel finish.

Equally important, the V-shape design offers a **much larger scale** for easier reading plus greater protection to the tube. Other important features of this new Thermometer are: double-strength, non-rattling glass shield, "snap-on" cap for easy removal of shield, and "Red-Reading-Mercury" for quick, accurate reading.

This Thermometer is ruggedly built and very adaptable with a wide range of fittings. Send for detailed Bulletins #46-2 and #46-3.

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Scale enclosed types for the chemical and allied industries. Engraved stem and scale enclosed thermometers for the plant and laboratory. All kind of Hydrometers.

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Am. Gas Accumulator
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Barber-Colman
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General Elec. Co.
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Lumenite Co.
Mason-Neilan Regulator
National Time & Signal
Paragon Electric Co.
Partlow Corp.
Photovolt Corp.
Potter & Brumfield
Production Inst. Co.
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Process Timers

Signal Timers

Time Switches

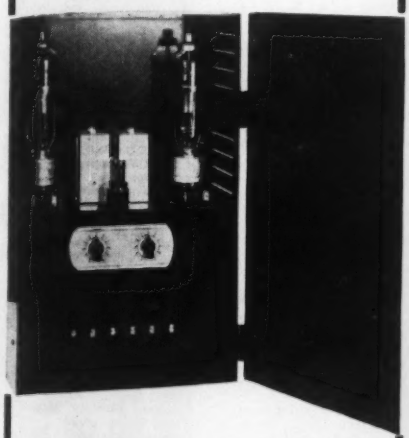
Relays

Write

AUTOMATIC
ELECTRIC
MANUFACTURING CO.
MANKATO, MINNESOTA

"EPCO" ELECTRONIC PRECISION CONTROLS

EPCO TIMERS FOR SPOT WELDING



Series A Non-synchronous for Welders to 1 KVA
Series B Synchronous for Welders to 45 KVA
Precision timing from ½ cycle up by finger tip adjustment.
Series B Includes phase shift heat control 20% to 100% heat in ten steps.

Send for literature

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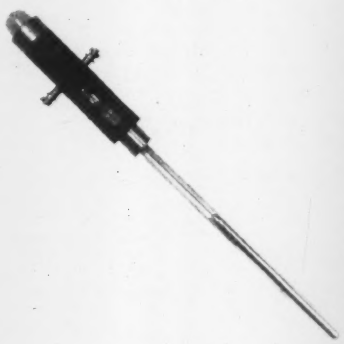
BOX 204 A R. R. 1
AURORA, ILLINOIS

WAGLINCO *Announces*

THREE NEW THERMOREGULATORS

for better temperature control at lower cost

Waglinco's outstanding new mercury thermoregulators are available in three types, each having individual design features, but all are sensitive to 0.02°F. or better. Complete instructions for setting these regulators at any point within the range of minus 30°F. to plus 700°F. are supplied with each Waglinco Thermoregulator. Resetting to any temperature point within the above range may be done as often as desired. Prompt delivery on all orders.



Signal-Light Thermoregulator
(patent pend.)

This new temperature regulator has a signal light mounted on top. The light glows brilliantly while temperature is rising and shuts off when setting temperature is reached, thus permitting operator to check readily operations. The newly designed plastic head provides full visibility for easy setting and a convenient means for mounting in laboratory or production equipment.

W001—Signal-Light Thermoreg. (6 in. long) $12.00
W002—Signal-Light Thermoreg. (8 in. long) 13.00
W003—Signal-Light Thermoreg. (10 in. long) 14.00
W004—Signal-Light Thermoreg. (12 in. long) 15.00

Split-Head Thermoregulator
(patent pend.)

The Split-Head Thermoregulator features locked-in studds which can not be turned in plastic mounting head, thus preventing the breaking of platinum contacts. A glass cap protects mercury reservoir and provides full visibility for easy setting. As in all Waglinco thermoregulators and thermostats, the mercury in the Split-Head type is of higher purity made possible by an improved distilling and filling method which contributes to more dependable and longer service.

W009—Split-Head Thermoreg. (6 in. long) $10.00
W010—Split-Head Thermoreg. (8 in. long) 11.00
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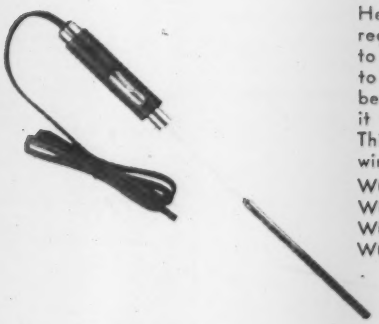
W012—Split-Head Thermoreg. (12 in. long) 13.00



Lead-Wire Thermoregulator

Here is Waglinco's latest development—a thermoregulator with a three-foot lead wire for connecting to current supply (relay). The lead wire is connected to the thermoregulator by means of a plug, and can be removed from the thermoregulator readily when it is necessary to change the temperature setting. This eliminates the bother of disconnecting the lead-wire from the relay.

W026—Lead-Wire Thermoreg. (6 in. long) $12.00
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W029—Lead-Wire Thermoreg. (12 in. long) 15.00

Suitable Relays for All Thermoregulators Are Available—Write for Information

Special Thermoregulators with a sensitivity of .004°F. are also available; write for prices. Thermoregulators and thermostats to fill specific requirements can be supplied on special order.

WASHINGTON GLASS LABORATORY
And Instrument Company
3224 Georgia Avenue, N.W. **Washington 11, D. C.**

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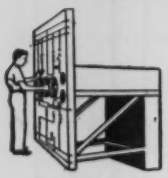
DESIGNED for INDUSTRIAL APPLICATIONS

● COMPLETE STANDARD LINE AVAILABLE
● SYSTEMS FOR SPECIAL REQUIREMENTS



Any number of related electrically-actuated operations may be simply and accurately controlled by ATC Timers for both sequence and duration. Circuits can be any number—from *one* to *thousands*—either consecutive or overlapping. Thousands of ATC Timers now installed on industrial machines and processes guarantee maximum production and uniformity by eliminating errors due to manual attention. Write for catalog data today.

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Logan St. & Germantown Ave. • Philadelphia 44, Pa.

QUALITY QUIZ

SUBJECT: "EGLASTATS"

QUESTION: Why do EGLASTATS assure greater accuracy, positive action and trouble-free operation of instruments in which temperature indication and control are a factor?

ANSWER: Only SUPER-PURO Mercury is used in EGLASTATS. This exclusive mercurial-refining process makes possible the finest mercurial instruments made. We re-refine the mercury in our own laboratory to remove every remaining particle of moisture or impurities.

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MERCURIAL SEALED-IN-GLASS THERMOSTATS

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Specialists in Temperature Indication, Control and Alarm
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Warren Telechron
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Am. Gas Accumulator
Assembly Products
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Automatic Elec. Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Betts & Betts
Bristol Co.
Brown Inst. Co.
Controls, Inc.
Cook Electric
Cramer Co., Inc.
Dayton Acme Co.
Eagle Signal Corp.
Eclipse-Pioneer Div.
Elec. Switch Corp.
Fisher-Pierce Co.
Foxboro Co.
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General Elec. Co.
Hanlon-Waters, Inc.
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West. Electro-Mechanical
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.
Zenith Electric Co.

TIMERS, AUTOMATIC, Interval
Abrams Instrument
Am. Gas Accumulator
Anderson, A. & J. M.
Automatic Elec. Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Bacon Electric Timer
Barber-Colman
Betts & Betts
Bristol Co.
Cincinnati Time Rec.
Controls, Inc.
Cook Electric
Cramer Co., Inc.
Dayton Acme Co.
Eagle Signal Corp.
Echo Electrical
Edison, Instrument Div.
Elec. Switch Corp.
Electro Products Lab.
Fink-Roselieve Co.
Fredericks Co., Geo.
Gaertner Scientific
General Electric X-Ray
Glogau & Co.
Gorrell & Gorrell
Guardian Elec. Mfg.
Hagedorn Engineering
Hankscraft Co.
Harvey Radio Labs.
Haydon Co.
Holland Research
Industrial Engr. Corp.
Industrial Timer Corp.
Leeds & Northrup
Lektra Labs.
Luers, J. Milton
Lumenite Co.
Lux Clock Mfg. Co.
Minneapolis-Honeywell
Metron Instrument
National Time & Signal
Paragon Electric Co.
Perfex Corp.
Photovolt Corp.
Potter & Brumfield
Production Inst. Co.
RCA Manufacturing Co.
Rhodes, Inc.
Richardson-Allen
Rowe Radio Research
Samsel Time Control
Standard Elec. Time
Stromberg Time Corp.
Struthers-Dunn
Taco Engineering
Tagliabue Div.
Taylor Inst. Co.
Thomas Clock Co.
Thompson Clock Co.
Thordarson Elec. Mfg.
United Cinephone
Walser Automatic Timer
Zenith Electric Co.

TIMERS, AUTOMATIC, Process
Abrams Instrument
Am. Gas Accumulator
Autocall Co.
Automatic Elec. Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Barber Colman
Betts & Betts
Bristol Co.
Cincinnati Time Rec.
Controls, Inc.
Cook Electric
Cramer Co., Inc.
Dayton Acme Co.
Denver Fire Clay
Eagle Signal Corp.
Elec. Switch Corp.
Electronics, Inc.
Electronic Prod. Co.
Foxboro Co.
Gaertner Scientific Corp.
General Elec. Co.
Haydon Co.
Industrial Engr. Corp.
Industrial Timer Corp.
Jardur Import
Lektra Labs.
Lumenite Co.
Magnetic Gauge Co.
Manning, Maxwell & Moore
National Time & Signal
Paragon Electric Co.
Partlow Corp.
Photovolt Corp.
Potter & Brumfield
Powers Regulator Co.
Richardson-Allen
Rowe Research Lab.
Seely Inst. Co., Inc.
Standard Elec. Time
Stromberg Time Corp.
Struthers-Dunn
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
United Cinephone Corp.
Wallace & Tiernan
West. Electro-Mechanical
Weston Elec. Inst. Corp.
Woermann-Schuchhardt
Zenith Electric Co.

TIMERS, AUTOMATIC, Spot Weld
Allen-Bradley Co.
Am. Gas Accumulator
Automatic Temp. Control
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Electronic Prod. Co.
General Elec. Co.
Industrial Timer
Metron Instrument Co.
National Time & Signal
Photovolt Corp.
Taco Engineering
United Cinephone Corp.

TITRATION APPARATUS, Electrometric
Burrell Technical Supply
Buhl Optical
Cambridge Instrument Co.
Central Scientific Co.
Coleman Electric Co.
Fisher Scientific Co.
Leeds & Northrup Co.
National Technical Labs.
Pfaltz & Bauer
Precision Scientific
Rubicon Co.
Sargent & Co., E. H.
Taco Engineering
Thomas Co., Arthur H.
Welch Mfg. Co.

TOOLS, Precision
American Measuring Insts.
DoAll Co.
Gallien R. P.
Ideal Lab. Tool
Lincoln Park Industries
Marshall Co.
Millers Falls
Pgh. Inst. & Mach.
Starrett Co.
Vinco Corp.

TOOLMAKER'S FLATS
Acme Industrial
Bausch & Lomb Opt.
Fecker, J. W.
Gaertner Scientific
Geophysical Inst. Co.
Optron Laboratory
Perkin-Elmer Corp.
Pratt & Whitney
Ruska & Co.
Unertl Optical Co.
Van Keuren Co.
Vinco Corp.
Zeiss, Inc., Carl

TOPOGRAPHIC INSTRUMENTS (See Surveying Instruments)

TORQUE GAGES (See Gages, Torque)

TORQUE MEASURING EQUIPMENT
Apco Mossberg Co.
General Elec. Co.
Hathaway Instrument
Skyway Prec. Tool
Snap-on Tools Corp.
Sturtevant Co.
Taco Engineering
Trimount Inst. Co.
Wa..gh Laboratories

TORSIOGRAPH
Baldwin-Southwark Corp.
Commercial Research
Consolidated Engg.
Waugh Labs.

TORSION METERS
Boulin Inst. Corp.
Chatillon & Sons
Cummings Mach. Works
Kurman Electric Co.
McNab of Bridgeport
Richie Div.
Sarl Inst. Co.
Taco Engineering
Toledo Scale Co.

TOTALIZERS, Demand
American Meter Co.
General Elec. Co.
Landis & Gyr
United Cinephone Corp.
Westinghouse Elec.

TOTALIZERS, Electric Energy
Autocall Co.
Bristol Co.
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
Westinghouse Elec.

TOTALIZERS, Fluid Flow
American Meter Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
General Elec. Co.
Hengsey Co.
Leupold & Stevens
Mason-Neilan Regulator
Republic Flow Meters
Revere Corp.
Simplex Valve & Meter
Sparling, R. W.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.

TOTALIZERS, Gas Flow
American Meter Co.
Bailey Meter Co.
Bristol Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Republic Flow Meters
Simplex Valve & Meter
Taco Engineering

TOTALIZERS, Running Time
Aero Instrument Co.
Bristol Co.
Cramer Co., Inc.
Elec. Tachometer Corp.
Gorrell & Gorrell
Industrial Timer Corp.
Photoswitch Inc
Production Instrument
Standard Elec. Time
Taco Engineering
United Cinephone Corp.
Westinghouse Elec. & Mfg.

TRAFFIC SIGNALING DEVICES (See Signaling Devices, Traffic)

TRAMMELS, Steel Beam
Union Tool Co.

TRANSFORMERS, Adjustable
Airdesign, Inc.
Allied Control Co.
Cole Instrument
Freed Transformer
General Radio Co.
Merit Coil & Transformer
Miller Transformer
Notheifer Winding Labs.
Raytheon Mfg. Co.
Sorensen & Co.
Superior Electric Co.
Taco Engineering
Thordarson Elec. Mfg.
United Transformer

TRANSFORMERS, Constant Voltage
Airdesign, Inc.
Cole Instrument
General Controls
Sola Electric Co.
Sorensen & Co.
Standard Transformer
Superior Electric Co.
Thordarson Elec. Mfg.
United Transformer
Westinghouse Elec.

TRANSFORMERS, Experimenter's Variable Voltage
Airdesign, Inc.
Allied Control Co.
Cole Instrument
DoAll Co.
Dongan Electric Mfg.
Freed Transformer
General Controls
General Radio Co.
Merit Coil & Transformer
Miller Transformer
Raytheon Mfg.
Sorensen & Co.
Standard Transformer
Sorvall, Ivan
Superior Electric Co.
Taco Engineering
Thordarson Elec. Mfg.
United Transformer
Walker-Jimieson, Inc.

TRANSFORMERS, Instrument
Airdesign, Inc.
Allied Control Co.
Allied Radio Corp.
Allis-Chalmers
Amplifier Co.

(Cont'd

TRANSFORMERS, Instrument (Cont'd)
Annis Co.
Associated Research
Audio Development
Burlington Inst. Co.
Chicago Transformer
Cole Instrument
Columbia Elec. Mfg.
Control Corp.
Davis & Co.
Dongan Electric Mfg.
Eastern Specialty Co.
Elec. Facilities, Inc.
Electronics, Inc.
Esterline-Angus Co.
Federal Telegraph Co.
Freed Transformer
Friez & Sons
General Controls
General Elec. Co.
Hickok Elec. Inst. Co.
Industrial Engr. Corp.
Kollsman Inst. Div.
Merit Coil & Trans.
Miller Transformer
New York Transformer
Nothelfer Winding Labs.
Roller-Smith Co.
Sangamo Electric Co.
Simpson Electric Co.
Sperry Gyroscope Co.
Standard Science Sup.
Thordarson Elec. Co.
Utah Radio Produs.
United Transformer Corp.
West, Electro-Mechanical
Westinghouse Elec.
Weston Elec. Inst. Corp.

TRANSFORMERS, Insulation Testing
Airdesign, Inc.
Amplifier Co.
Campbell Electric
Dongan Electric Mfg.
Freed Transformer
General Controls
General Elec. Co.
Merit Coil & Trans.
Miller Transformer
Nothelfer Winding Labs.
Raytheon Mfg. Co.
Sherron Metallic
Superior Electric Co.
Taco Engineering
Thordarson Elec. Mfg.
United Transformer

TRANSFORMERS, Laboratory
Airdesign, Inc.
Allied Control Co.
Allied Radio Corp.
(Cont'd)

TRANSFORMERS, Laboratory (Cont'd)
American Transformer
Amplifier Co.
Audio Development
Burrell Tech. Supply
Central Scientific Co.
Clough-Brengle Co.
Cole Instrument
Daven Co.
Davis & Co.
Dongan Electric Mfg.
Eastern Specialty Co.
Elec. Facilities, Inc.
Freed Transformer
General Elec. Co.
General Radio Co.
Gorrell & Gorrell
Halldorson Co.
Merit Coil & Trans.
Miller Transformer
New York Transformer
Nothelfer Winding Labs.
Raytheon Mfg. Co.
Scientific Glass App.
Sola Electric Co.
Standard Elec. Prods.
Standard Transformer
Superior Electric Co.
Taco Engineering
Thordarson Elec. Co.
United Transformer Corp.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

TRANSFORMERS, Phasing
Airdesign, Inc.
Allied Radio Corp.
Davis & Co.
Dongan Electric Mfg.
Eastern Specialty Co.
Freed Transformer
General Elec. Co.
Merit Coil & Trans.
New York Transformer
Nothelfer Winding Labs.
Raytheon Mfg. Co.
States Co.
Thordarson Mfg. Co.
United Transformer Corp.
Westinghouse Elec. & Mfg.

TRANSFORMERS, Power
Airdesign, Inc.
Allied Control Co.
Allied Radio Corp.
Allis-Chalmers
Amplifier Co.
Audio Development
Chicago Transformer
Dongan Elec. Mfg.
Federal Telegraph Co.
Ferranti Electric
(Cont'd)

TRANSFORMERS, Power (Cont'd)
Freed Transformer
General Controls
General Elec. Co.
Harvey Radio Labs.
Merit Coil & Trans.
Miller Transformer
New York Transformer
Nothelfer Winding Labs.
Samsel Time Control
Sola Electric Co.
Sorensen & Co.
Standard Transformer
Thermador Elec.
Thordarson Elec. Mfg.
United Transformer

TRANSFORMERS, Split Core
Airdesign, Inc.
Allied Radio Corp.
Annis Co.
Cole Instrument
Davis & Co.
Elec. Facilities, Inc.
Esterline-Angus Co.
Freed Transformer
General Elec. Co.
H-D Elec. Co.
Industrial Eng. Corp.
Roller-Smith Co.
Rubicon Co.
Sangamo Electric Co.
Thordarson Elec. Co.
United Transformer Corp.
Western Electro-Mech.
Westinghouse Elec. & Mfg.

TRANSFORMERS, Variable Voltage Testing
Airdesign, Inc.
Allied Control Co.
American Transformer
Cole Instrument
Dongan Electric Mfg.
Federal Telegraph Co.
General Radio Co.
Gulow Corp.
Miller Transformer
Nothelfer Winding Labs.
Raytheon Mfg. Co.
Sorensen & Co.
Standard Transformer
Superior Electric Co.
Taco Engineering
Thordarson Elec. Mfg.
United Transformer

TRANSFORMERS, Voltage Regulating
Airdesign, Inc.
Allied Radio Corp.
Allis-Chalmers
Amplifier Co.
Cole Instrument
Davis & Co., Inc., Dean
Echo Electrical
General Elec. Co.
Miller Transformer
Sola Electric Co.
Sorensen & Co.
Standard Transformer
Superior Electric
Taco Engineering
Thordarson Elec. Mfg.
United Transformer Corp.

TRANSITS, Engineer's (See Surveying Instruments)

TRANSITS, Pocket
Ainsworth & Sons
Keuffel & Esser Co.
Mico Instrument Co.
Speidel & Co.
United States Blue Print
Warren-Knight Co.
White Co., Inc.

TRUCK MILEAGE RECORDERS (See Meters, Mileage)

TRUCK-TIME RECORDERS
Knopf, Paul
Ohmer Register Co.
Service Recorder Co.

TRUCK, TIME & MILEAGE RECORDERS
Cramer & Co., Inc.
Ohmer Register Co.
Sangamo Electric Co.

TUBES (See also Gas & Vapor Discharge Tubes)

TUBES, Cathode Ray (See Cathode Ray Tubes)

TUBES, Nessler (See Nessler Tubes)

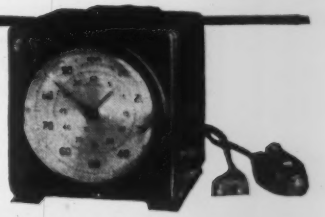
TUBES, Oil Centrifuge (See Oil Centrifuge Tubes)

TUBES, Photoelectric
Continental Electric Co.
Eby, Inc.
General Electric Co.
General Scientific Corp.
Photobell Corp.
RCA Manufacturing
Standard Arcturus
United Cinephone Corp.
Vacutron, Inc.
Walker-Jimieson, Inc.

TUBES, Pitot (See Flowmeters, Pitot Tube)

TUBES, Polariscope
American Inst. Co.
Bausch & Lomb Optical
Central Scientific Co.
Eimer & Amend
Fecker, J. W.
Gaertner Scientific Corp.
Hellige, Inc.
(Cont'd)

STANDARD PRECISION TIMERS



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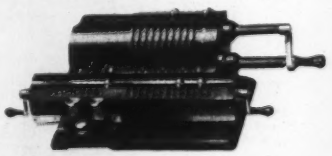
Model	Reads	Totalizes	ACCURACY	Net Price
S-100	1/5 sec.	6000 sec.	± .02 sec.	$41.80
S-60	1/5 sec.	60 min.	± .02 sec.	$41.80
S-10	1/10 sec.	1000 sec.	± .02 sec.	$41.80
S-6	1/1000 min.	10 min.	± .02 sec.	$55.00
S-1	1/100 sec.	60 sec.	± .01 sec.	$55.00
MST	1/1000 sec.	.360 sec.	± .001 sec.	$88.00
SM-60	1/100 min.	60 min.	± .02 sec.	$41.80

Write for Bulletin 149. Please mention this publication when writing

THE STANDARD ELECTRIC TIME CO.
Founded 1884
SPRINGFIELD 2, MASSACHUSETTS

ORIGINAL-ODHNER
"THE MACHINE TO COUNT ON"



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Efficient • Sturdy • Low Priced
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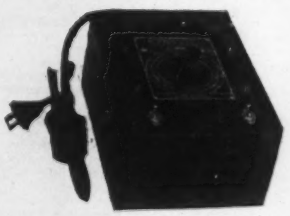
SERVALL
VARIABLE TRANSFORMER



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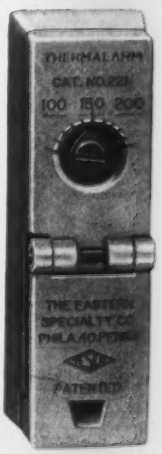
IVAN SORVALL
210 FIFTH AVE., NEW YORK 10, N. Y.

SAFEGUARD YOUR TRANSFORMERS WITH A TESCO THERMALARM



Housed in a Melmac plastic case, 3⅜" long by 1-1/16" wide by 1-1/16" deep, the unit has a die-cast aluminum base, which acts as the heat conductor, projecting from the back. When the safe operating temperature is exceeded, a flag which is spring-actuated and which is normally in a downward position, flies up and presents a brilliant red surface that is large enough to be visible from the ground level.

Write for Bulletin No. 870

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3617 NORTH EIGHTH STREET
PHILADELPHIA 40, PA.

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MADE of all machinable metals, capable of handling most corrosive materials. Manufactured to the ultimate in exacting tolerances. Individually tested to **assure** satisfactory performance.

Inquiries Are Invited

TRINITY EQUIPMENT & SUPPLY CO.

605 BROAD STREET • NEWARK 2, N. J.

TUBES, Polariscope (Cont'd)
Jarrell-Ash Co.
Precision Scientific Co
Rudolph & Sons
Sargent & Co
Will Corporation
Woermann-Schuchhardt

TUBES, Precision Bore (See Precision Bore Glass Tubing)

TUBES, Pyrometer
Bristol Co.
Brown Inst. Co.
Campbell Co., J. A.
Cole Instrument
Kitgen Co
Elematic Equip. Corp.
Engelhard, Chas.
Fish-Schurman Corp.
Foxboro Co.
Hoskins Mfg. Co.
Illinois Testing Labs.
Jerguson Gage & Valve
Leeds & Northrup Co.
Norton Co.
Pyrometer Service Co.
Richards, Arklay S.
Taco Engineering
Tagliabue Div.
Taylor Instrument Cos.
Thermo-Electric Co.
Thwing-Albert Inst. Co.
Trinity Equipment
Wheatstone Corp.
Wheelco Instruments

TUBES, Spectrum (See Spectrum Tubes)

TUBES, Ultra-Violet Light (See Ultra-Violet Light Sources)

TUBES, Vacuum
Ballantine Labs.
Central Scientific Co.
Electronic Products Co.
Electrons, Inc.
Federal Telegraph
Fredericks, George
General Elec. Co.
General Scientific Corp.
General Television Corp.
North Amer. Philips
Raytheon Mfg. Co.
RCA Manufacturing Co.
Standard Arcturus
Vacutron, Inc.
Victoreen Instrument
Walker-Jimieson, Inc.
Western Electric
Wheelco Inst. Co.

TUBES, Venturi (See Flowmeters, Venturi)

TUBES, X-Ray
American Inst. Co.
Baird Associates
Corning Glass Works
General Electric X-Ray
Goetze Niemer Co.
Jarrell-Ash Co.
Kelley-Koett Mfg.
North Amer. Philips
Standard Arcturus
Stoelting Co., C. H.
Westinghouse Elec.
Westinghouse X-Ray Co.
Wyland, George

TUNING FORKS, Electrically Driven (See Forks, Tuning)

TURBIDIMETERS
American Inst. Co.
Cargille, R. P.
Central Scientific Co.
Elmer & Amend
Esa Instrument Co.
Fisher Scientific Co.
Hellige, Inc.
Klett Mfg. Co.
Kimble Glass Co.
Parr Instrument Co.
Pfaltz & Bauer, Inc.
Photoswitch, Inc.
Photovolt Corp.
Precision Scientific Co.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.
Zeiss, Inc., Carl

TURN & BANK INDICATORS
Eclipse-Pioneer Div.
Kollsman Inst. Co.

TURN INDICATOR TESTERS (See Testers, Turn Indicator)

TWEEZERS
Goetze Niemer Co.
Marshall Co.

TWIST COUNTERS (See Counters, Twist)

ULTRA-VIOLET INDICATORS & RECORDERS
Gen. Elec. Lamp Dept.
Hanovia Chem. & Mfg. Co.
Photovolt Corp.

ULTRA-VIOLET LIGHT SOURCES (See Light Sources)

U-TUBE MANOMETERS (See Manometers)

VACUUM GAGES, Hot-Wire
Baird Associates
Continental Elec. Co.
Distillation Products
Fredericks Co., Geo.
Fuess, Inc.
General Elec. Co.
Taco Engineering
Winslow Co.
Xervac Inst. Co.

VACUUM GAGES, Ionization
Ballantine Labs.
Consolidated Engg.
Distillation Products
Fredericks, George
General Elec. Co.
General Television Corp.
Precision Scientific
Stoelting Co., C. H.
Taco Engineering
Welch Scientific

VACUUM GAGES, Liquid-column
American Meter Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Defender Automatic Reg.
Distillation Products
Dubrovin, John
Dwyer Mfg. Co.
Foxboro Co.
Gas Appliance Specialties
Ideal Lab. Tool
Jerguson Gage & Valve
Lantz-Phelps Corp.
Meriam Co.
Moeller Inst. Co.
Pioneer Instrument
Precision Term. & Inst.
Scientific Glass Apparatus
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.
Welch Scientific

VACUUM GAGES, McLeod
Ace Glass, Inc.
Central Scientific Co.
Distillation Products
Elmer & Amend
Electronic Products Co.
General Elec. Co.
General Physical Lab.
Macalaster Bicknell Co.
Scientific Glass Apparatus
Stoelting Co., C. H.
Stokes Machine Co.
Welch Scientific

VACUUM GAGES, Pirani Type
Ballantine Labs.
Continental Electric
Distillation Products
General Elec. Co.
Taco Engineering
Welch Scientific
Winslow Co.

VACUUM, Indicators
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Baird Associates
Bristol Co.
Brown Inst. Co.
Central Scientific Co.
Clapp Instrument
Distillation Products
Elmer & Amend
Foxboro Co.
Fredericks, George
General Elec. Co.
Kollsman Inst. Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Co.
Moeller Instrument Co.
Pioneer Instrument
Potter Co.
Precision Scientific
Precision Therm.
Rawson Electrical Inst.
Republic Flow Meters
Rochester Mfg. Co.
Scientific Glass Apparatus
Star Brass Mfg. Co.
Statham Labs.
Stoelting Co., C. H.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.

VACUUM, HIGH (below 1 mu) Controllers, Indicators & Recorders
Baird Associates
Continental Elec. Co.
Distillation Products
Elmer & Amend
Electronic Prod. Co.
Fredericks Co., Geo.
General Elec. Co.
General Physical Lab.
National Research
Shallcross Controls
Stoelting Co., C. H.
Taco Engineering
Weksler Thermometer
Welch Mfg. Co.

VACUUM RECORDERS
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Bristol Co.
Brown Inst. Co.
Dickson Co.
Distillation Products
Esterline-Angus Co.
Fish-Schurman Corp.
Foxboro Co.
Fredericks, George
Gotham Inst. Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Precision Scientific
Republic Flow Meters
Schwien Engineering
Scientific Instrument Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.
Weksler Thermometer

VACUUM SPECTROGRAPHS (See Spectrographs, Vacuum)

VACUUM TUBES (See Tubes, Vacuum)

VACUUM TUBE BRIDGES (See Bridges, Vacuum Tube)

VACUUM TUBE RELAYS (See Relays, Vacuum Tube)

VACUUM TUBE VOLTMETERS (See Voltmeters, Vacuum Tube)

VALVE BOX FINDER (See Finder, Valve Box)

VALVE-OPERATING DEVICES, Electric Motor
Automatic Temp. Control
Baldwin-Southwark Corp.
Barber-Colman Co.
Beck Co.
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cleveland Fuel Engr.
Continental Equip. Co.
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Dickson Co.
Eclipse-Pioneer Div.
Foxboro Co.
General Controls Co.
Hays Corp.
Illinois Eng. Co.
Jenkins Bros.
McAlear Mfg. Co.
Robinette Co., W. C.
Ruggles-Klingemann
Shallcross Controls
Taco Engineering
Tagliabue Div.

VALVE OPERATING DEVICES, Electric Solenoid (See Valves, Solenoid)

VALVE OPERATING DEVICES, Hydraulic (See Valves, Hydraulically Operated)

VALVE-OPERATING DEVICES, Pneumatic (See Valves, Diaphragm)

VALVE POSITION INDICATORS
Adel Precision
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Barber Coleman
Beck Co.
Bendix Marine Products
Bristol Co.
Builders-Providence
Cutler-Hammer, Inc.
Elec. Indicator Corp.
Elec. Tachometer Corp.
Foxboro Co.
General Controls
General Regulator Corp.
Hanlon-Waters, Inc.
Kiely & Mueller
Leupold & Stevens
Manning, Maxwell & Moore
Merco Nordstrom Valve
Moore Products
Northern Equip. Co.
Republic Flow Meters
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Tefft-Jackson, Inc.
Westinghouse Elec. & Mfg.

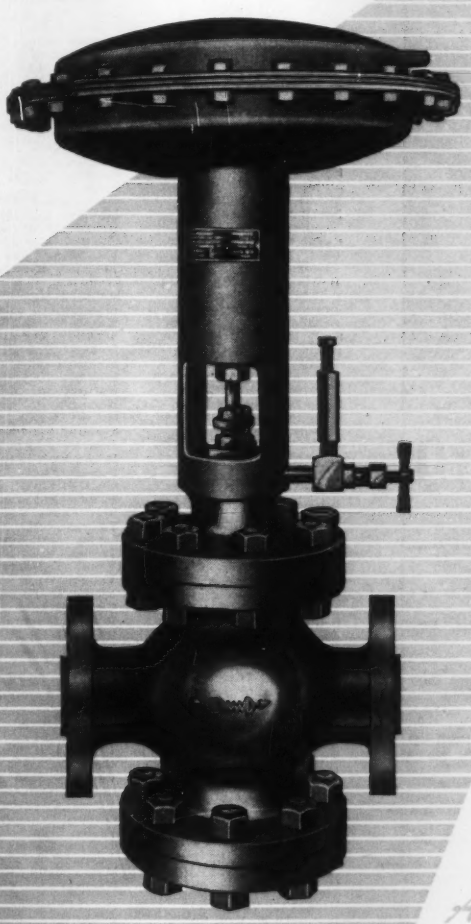
VALVES, Automatic Shut-off
Adel Precision
Askania Regulator Co.
Automatic Switch Co.
Automatic Temp. Control
Automatic Valve Control
Barber-Colman
Bastian-Blessing
Belfield Co.
Brown Inst Co.
Cash Co.
Continental Equip. Co.
Davis Reg. Co.
Edison, Instrument Div.
Fisher Governor Co.
Foster Engg. Co.
Frick Co.
Frisz & Sons
General Controls Co.
General Sales & Prod.
Hanlon-Waters, Inc.
Hunt & Son
Jerguson Gage Co.
Kiely & Mueller
Leslie Co.
McAlear Mfg. Co.
McDonnell & Miller
Merco Nordstrom Valve
Minneapolis-Honeywell
North Amer. Mfg. Co.
Partlow Corp.
R-S Prod. Corp.
Ruggles-Klingemann
Payne Furnace & Supply
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Taco Engineering
Tagliabue Div.
Wheelco Instruments
Wilgus Mfg. Co.

VALVES, Automatic Solenoid (See Valves, Solenoid)

AUTOMATIC CONTROL EQUIPMENT

ENGINEERED DESIGN BY HAMMEL-DAHL

Hammel-Dahl VALVE DESIGN FEATURES



Sensitivity

Diaphragm responsive to minute loading pressure change of control instrument.

Simplicity

Unit top and body construction.

Flexibility

Valve action is reversible in field, with no additional parts, in valve trim sizes of 3/16" through 12".

Ruggedness

All-steel top and rugged construction through-out.

Safety

All-steel construction permits installation in hazardous fire areas.

Reliability

Valve plug is guided top and bottom.

Continuity of indication

Valve plug stem position indicator is standard on all models.

Accessibility for adjustments

Open window permits easier adjustment of bolted stuffing gland.

Ease of installation

Valve can be installed in a vertical pipe run with no additional superstructure support.

Standardization

All flanged valves 1¼" and larger have ASA STANDARD FACE-TO-FACE Dimensions.

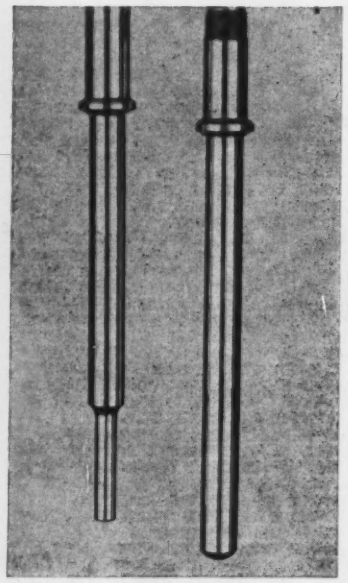
HAMMEL-DAHL COMPANY

243 RICHMOND STREET PROVIDENCE, R. I.

HOUSTON CLEVELAND DETROIT SAN FRANCISCO
ST. LOUIS, MO. LOS ANGELES PITTSBURGH WILMINGTON, DEL.
NEW YORK CHICAGO NEW HAVEN OAKVILLE, ONTARIO MEXICO, D. F.

Thermocouple - Thermometer WELLS . . .

- **Projected Portion from 3½" up**
- **Stainless Steel or Cold Rolled Steel or Other Alloys**
- **Internal Hydrostatic Tested**
- **Projected Surface Highly Polished to make slightly harder**



These are the highlights of the JERGUSON Thermocouple-Thermometer WELL for high pressure, high temperature, corrosive conditions. Its heavy construction makes it ideal for such service. Prompt deliveries. Write for prices.

* * *

We have other wells for lighter, less severe service consisting of stainless steel tubing with ends spun and welded; also test wells.

JERGUSON GAGE & VALVE CO.

111 Fellsway, Somerville 45, Mass.

VALVES, Balanced
Acme Industrial
American Meter Co.
Atlas Valve Co.
Bailey Meter Co.
Baldwin Southwark
Barber Coleman
Belfield Co.
Boylston Co.
Bristol Co.
Cash Co.
Cochrane Corp.
Connelly Iron Sponge
Davis Reg. Co.
Defender Automatic Reg.
D'Este Division
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
General Controls Co.
Hammel-Dahl Co.
Hanlon-Waters, Inc.
Hunt & Son
Illinois Eng. Co.
Jenkins Bros.
Kiely & Mueller
Klingerit, Inc.
Klipfel Mfg. Co.
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Minneapolis-Honeywell
Natural Gas Equipment
North Amer. Mfg. Co.
Northern Equip. Co.
Powers Regulator Co.
Republic Flow Meters
(Cont'd)

VALVES, Balanced
(Cont'd)
Reynolds Gas Regulator
Ruggles-Klingemann
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Spence Engineering Co.
Tagliabue Div.
Trerice Co.
Watts Regulator Co.
Wilgus Manufacturing
Wood, Harry W.

VALVES, Constant Pressure
Adel Precision
Bailey Meter Co.
Bastian-Blessing Co.
Belfield Co.
Brooke Engineering
Cash Co.
Connelly Iron Sponge
Davis Reg. Co.
D'Este Division
Fisher Governor Co.
Foster Engg. Co.
General Controls
Hanlon-Waters, Inc.
Hoke, Inc.
Hunt & Son
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator
Northern Equipment
(Cont'd)

VALVES, Constant Pressure (Cont'd)
Powers Regulator Co.
Refrigerating Spec. Co.
Reynolds Gas Regulator
R-S Prod. Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Spence Engineering Co.
Tagliabue Div.
Taylor Inst. Co.
Vaughn-G E. Witt Co.
Watts Regulator Co.
Wilgus Manufacturing

VALVES, Diaphragm
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Bastian-Blessing Co.
Belfield Co.
Boylston Co.
Bristol Co.
Brown Inst. Co.
Cash Co.
Connelly Iron Sponge
Continental Equip. Co.
Cook Electric
Davis Reg. Co.
Defender Automatic Reg.
D'Este Division
Eclipse-Pioneer Div.
Fisher Governor
Foster Engg. Co.
Foxboro Co.
General Controls Co.
Gotham Inst. Co.
Hagan Corp.
Hammel-Dahl Co.
(Cont'd)

VALVES, Diaphragm
(Cont'd)
Hanlon-Waters, Inc.
Hoke, Inc.
Hunt & Son
Illinois Eng. Co.
Johnson Service Co.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell-Miller
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
North Amer. Mfg. Co.
Partlow Corp.
Payne Furnace & Supply
Powers Regulator Co.
Refrigerating Spec. Co.
Republic Flow Meters Co.
Reynolds Gas Regulator
Ruggles-Klingemann
Schade Valve Mfg. Co.
Scientific Instrument Co.
Seely Inst. Co., Inc.
Spence Engineering Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Vaughn-G E. Witt
Watts Regulator
White-Rodgers Electric
Wilgus Manufacturing
Wood, Harry W.

VALVES, Electrically Operated
Adel Precision
Atlas Valve Co.
Automatic Products Co.
Automatic Switch Co.
Automatic Temp. Control
Baldwin Southwark
Barber-Colman
Beck Co.
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cochrane Corp.
Cutler-Hammer, Inc.
Davis Reg. Co.
Defender Automatic Reg.
Distillation Products
Electric Valve Mfg.
Electrimatic Corp.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Friez & Sons
General Controls Co.
Hannifin Mfg. Co.
Hunt & Son
Illinois Eng. Co.
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
Leslie Co.
Magnatrol Valve Corp.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Nordstrom Valve
Midwest Aircraft Prods.
Minneapolis-Honeywell
North Amer. Mfg. Co.
Northern Equipment Co.
Payne Furnace & Supply
Penn Electric Switch
Perfex Corp.
Refrigerating Spec. Co.
R-S Prod. Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Shallcross Controls
Shallcross Mfg. Co.
Spence Engineering Co.
Supreme Elec. Prods.
Taco Engineering
Tagliabue Div.
Wheelco Instruments
White-Rodgers Elec. Co.

VALVES, Hydraulically Operated
Acme Industrial
Adel Precision
Arca Regulators, Inc.
Askania Regulator
Atlas Valve Co.
Auto. Temp. Control
Bailey Meter
Baldwin Southwark
Barber-Coleman Co.
Cash Co.
Continental Equip. Co.
Controls, Inc.
Defender Automatic Reg.
Eclipse-Pioneer Div.
Fisher Governor
Ford Reg. Valve
Foster Engg. Co.
General Controls
Gen. Electric Co.
Hagan Corp.
Hays Corp.
Hunt & Son
Hydraulic Controls, Inc.
Jenkins Bros.
Johnson Service Co.
Kiely & Mueller
Leslie Co.
Leupold & Stevens
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Nordstrom Valve
North Amer. Mfg. Co.
Positel Mfg. Co.
Powers Regulator Co.
Republic Flow Meter
R-S Prod. Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Shallcross Controls
Spence Engineering Co.
Sterling Eng. Co.
Taco Engineering
Vinco Corp.

VALVES, Lubricated Plug
Acme Industrial
Nordstrom Valve Co.

VALVES, Motor Operated (See Valves, Diaphragm; Valves, Electrically-operated; Valves, Hydraulically - operated; Valves, Solenoid)

VALVES, Pressure Relief, Reducing, etc.
Abercrombie Pump Co.
Acme Industrial
Adel Precision
American Meter Co.
Ashton Valve Co.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Bastian-Blessing Co.
Belfield Co.
Boylston Co.
Bristol Co.
Brown Instr. Co.
Cash Co.
Cochrane Corp.
Connelly Iron Sponge
Crosby Steam Gage Co.
Davis Reg. Co.
D'Este Division
Eclipse-Pioneer Div.
Fisher Governor Co.
Ford Reg. Valve
Foster Engg. Co.
Foxboro Co.
Frick Co.
General Controls
Gotham Inst. Co.
Hagan Corp.
Hammel-Dahl Co.
Hanlon-Waters, Inc.
Hoke, Inc.
Illinois Eng. Co.
Johnston & Jennings Co.
Kenyon Instrument Co.
Kiely & Mueller
Klipfel Mfg. Co.
Lammert & Mann Co.
Leslie Co.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercon Regulator
Minneapolis-Honeywell
Natural Gas Equipment
Northern Equipment
Powers Regulator Co.
Republic Flow Meters
Ruggles-Klingemann
Ruska Inst. Corp.
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Spence Engineering Co.
Star Brass Mfg. Co.
Tagliabue Div.
Taylor Instr. Cos.
Trerice Co.
Vapor Recovery Systems
Vaughn-G. E. Witt Co.
Victor Equipment Co.
Watts Regulator Co.
Wilgus Manufacturing
Wood, Harry W.

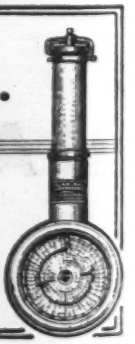
VALVES, Proportional Air-Gas
American Meter Co.
Askania Regulator Co.
Automatic Temp. Control
Barber-Colman
Bristol Co.
Brown Inst. Co.
Cash Co.
Connelly Iron Sponge
Cutler-Hammer, Inc.
Fisher Governor Co.
General Controls
Hagan Corp.
Hanlon-Waters, Inc.
Lammert & Mann Co.
Mason-Neilan Regulator
McAlear Mfg. Co.
R-S Prod. Corp.
North Amer. Mfg. Co.
Tagliabue Div.
Trerice Co.

VALVES, Regulating
Am. Gas Furnace Co.
American Meter Co.
Arco Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
Automatic Valve Control
Bailey Meter Co.
Barber Coleman
Bastian-Blessing Co.
(Cont'd)

UEHLING INSTRUMENT CO.

Vacuum-Draft-CO_2
Absolute Pressure Recorders - Liquid Level Gauges

473 GETTY AVENUE
PATERSON, N.J.



VALVES, Regulating (Cont'd)
Belfield Co.
Boylston Co.
Boiler Room Equipment
Bristol Co.
Brooke Engineering
Brown Inst. Co.
Cash Co.
Cochrane Corp.
Connelly Iron Sponge
Cook Electric
Davis Reg. Co.
Defender Automatic Reg.
D'Este Division
Electromatic Corp.
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
Friez & Sons
Fulton Syphon Co.
General Controls Co.
Hagan Corp.
Hammel-Dahl Co.
Hanlon Waters, Inc.
Hannifin Mfg. Co.
Hoke, Inc.
Illinois Eng. Co.
Jenkins Bros.
Kiely & Mueller
Klipfel Mfg. Co.
Lammert & Mann Co.
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Mercon Regulator
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
Nordstrom Valve
North Amer. Mfg. Co.
Northern Equipment Co.
Partlow Co.
Parr Inst. Co.
Powers Regulator Co.
Republic Flow Meters
Robertshaw Thermostat
R-S Prod. Corp.
Ruggles-Klingemann
Ruska Inst. Corp.
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Shallcross Controls
Spence Engineering Co.
Taco Engineering
Tagliabue Div.
Taylor Inst. Cos.
Trerice Co.
Vaughn G. E. Witt
Victor Equipment Co.
Watts Regulator Co.
Wheelco Instruments
Wilgus Manufacturing

VALVES, Safety Fuel Shut-off
American Meter Co.
Askania Regulator Co.
Atlas Valve Co.
Automatic Products Co.
Automatic Switch Co.
Bastian-Blessing
Bristol Co.
Brown Inst. Co.
Cash Co.
Continental Equip. Co.
Davis Reg. Co.
D'Este Co.
Eclipse Fuel Engg. Co.
Fisher Governor
Friez & Sons
Fulton Syphon Co.
General Combustion Corp.
General Controls Co.
Hanlon Waters, Inc.
Kiely & Mueller
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Milwaukee Gas Specialty
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipment
North Amer. Mfg. Co.
Partlow Corp.
Payne Furnace & Supply
Penn Electric Switch
Preferred Utilities Mfg.
Ruggles-Klingemann
Ruska Inst. Corp.
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Spence Engineering Co.
Taco Engineering
Tagliabue Div.
Viking Instrument Co.
Wheelco Instruments
Wilgus Manufacturing

VALVES, Solenoid
Adel Precision
Atlas Valve Co.
Automatic Products Co.
Automatic Switch Co.
Barber-Colman Co.
Brown Inst. Co.
Continental Equip. Co.
Cook Electric
Cutler-Hammer, Inc.
Davis Reg. Co.
Distillation Products
Electric Valve Mfg. Co.
Electrimatic Corp.
Foxboro Co.
Frick Co.
Friez & Sons
General Controls Co.
Gen. Elec. Co.
General Sales & Prod. (Cont'd)

VALVES, Solenoid (Cont'd)
Gordon Co., Claud S.
Guardian Elec. Mfg.
Hannifin Mfg. Co.
Hays Corp.
Hunt & Son
Leslie Co.
Magnatrol Valve Corp.
McDonnell & Miller
Midwest Aircraft Prods.
Minneapolis-Honeywell
Northern Equip. Co.
Partlow Corp.
Penn Electric Switch
Perfex Corp.
Refrigerating Spec. Co.
R-S Prod. Corp.
Ruggles-Klingemann
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Shallcross Controls
Spence Engineering Co.
Sterling Eng. Co.
Supreme Elec. Prods.
Taco Engineering
Tagliabue Div.
Taylor Inst. Co.
Wheelco Instruments
White Rodgers Elec.

VALVES, Thermostat (See Thermostats)

VAR METERS, See Volt-ampere Meters, Reactive

VEHICLE TRAVEL RECORDERS
Commercial Research
Cramer & Co.
Elec. Tachometer Corp.
Knopf, Paul
Ohmer Register Co.
Pittsburgh Taximeter Co.
Service Recorder Co.
Waugh Labs.

VENTURI METERS (See Flowmeters, Venturi)

VENTURI TUBES (See Flowmeters, Venturi)

VIBRATION PICKUPS
Amperite Co.
Brush Development Co.
Commercial Research
Consolidated Engg.
Crystal Research Labs.
Electronic Engineers
General Radio Co.
Geophysical Inst. Co.
Heiland Research
M B Mfg. Co.
Miller Corp., Wm.
Shure Bros., Inc.
Waugh Labs.
Western Electric
Westinghouse Elec.

VIBROGRAPHS
Baldwin-Southwark Corp.
Buehler, Adolph I.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Commercial Research
Consolidated Engg.
Heiland Research
Impact Register Co.
RCA Manufacturing Co.
Ruska & Co.
Waugh Laboratories
Westinghouse Elec.

VIBROMETERS
American Inst. Co.
Associated Research
Ballantine Labs.
Consolidated Engg.
Electrocon Corp.
General Radio Co.
Hathaway Instrument
Heiland Research
Miller Corp., Wm.
Potter Co.
Suter, Alfred
Taco Engineering
Televiso Co.
Waugh Labs.
Western Electric
Westinghouse Elec.

VIBROSCOPES
Amperite Corp.
Coleman Instrument
Commercial Engg. Labs.
Consolidated Engg.
General Elec. Co.
Heiland Research Corp.
Kurman Electronics
Waugh Labs.

VICAT NEEDLES (See (See Needles, Vicat)

VISCOSIMETER BATHS, Constant-temperature
Brabender Corp.
Central Scientific Co.
Fish-Schurman Corp.
Fisher Scientific Co.
Precision Scientific Co.
Ruska & Co., Inc.
Sargent & Co., E. H.
Scientific Glass App.
Tagliabue Div.
Thomas Co., Arthur H.

VISCOSIMETERS, Brookfield
Brookfield Eng. Labs.

VISCOSIMETERS, Engler
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Humboldt Mfg. Co.
Kimble Glass
Precision Scientific Co.
Rushfel Co.

HIGH VACUUM?

RECORD AND CONTROL WITH

TELEVAC

TWO MODELS NOW AVAILABLE

FOR ACCURATE RECORDS DOWN TO .001 MICRON
(10^{-6}mm Mercury)

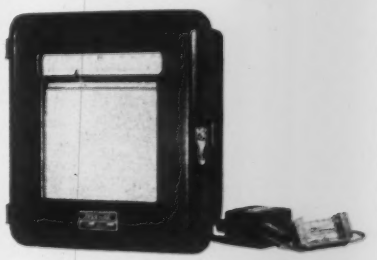
MODEL S TELEVAC

- No Outgassing of Gauges
- Constant Calibration
- No Electrical Leakage
- Interchangeable Gauges
- Gauges Gauranteed 1000 Hours
- Cannot Burn Out Due to Accidents
- Dual Range: 0 to 500μ —0 to 0.4μ
- Adaptable to All High Vacuum Processes
- Extremely Simple to Operate
- Accurate, Continuous Record tells the Whole Story—permanently

FOR ACCURATE RECORDS DOWN TO 1 MICRON

MODEL MR TELEVAC

- Constant Calibration
- Interchangeable Gauges
- No Batteries—Uses 115V. A. C.
- Range: 0 - 500 Microns
- Adaptable to Automatic Exhaust Machines
- Can Operate Auxiliary Relays at Pre-determined Pressures



Write for our new Bulletin E-101

GEORGE E. FREDERICKS
Company
BETHAYRES
PENNSYLVANIA

HIGH VACUUM TECHNICIANS . . . CONSULTING ENGINEERS
Manufacturers of Scientific Glassware and Precision Instruments for Over 10 Years

"You CAN take it with you.."

if it's a

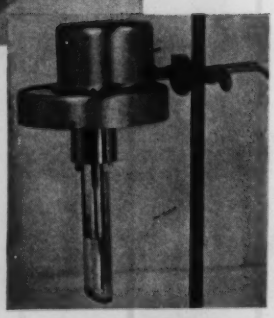
BROOKFIELD
SYNCHRO-LECTRIC
VISCOSIMETER

Making Viscosity tests at point of process is a snap with the Brookfield Viscosimeter. All you need is a convenient electrical outlet and you're set to take readings of high accuracy in 30 seconds.

Readings given directly in centipoises over wide ranges. Temperatures up to 600 F. No adjustments necessary. Requires no technical skill.

PORTABLE!
USE IN PLANT OR LAB

Same instrument can be used in both plant and lab Use as a portable instrument shown at left Operates on 60 cycle 110 volt current



When instrument is needed for stationary use only it may be mounted on a rod clamp as shown at right. Handles are interchangeable.

BROOKFIELD
ENGINEERING LABORATORIES
BOX 603-B, SHARON, MASS.

VISCOSIMETERS, Fenske
American Inst. Co.
Kimble Glass
Precision Scientific
Tagliabue Div.

VISCOSIMETERS Ford (For Paint)
Central Scientific Co.
Eimer & Amend
Scientific Inst. Co.

VISCOSIMETERS, Hoeppler
Central Scientific Co.
Fish-Schurman Co.
Precision Scientific
Sargent & Co.

VISCOSIMETERS, Kinematic
Braun Corp.
Eimer & Amend
Precision Scientific Co.
Tagliabue Div.

VISCOSIMETERS, MacMichael
Eimer & Amend

VISCOSIMETERS, Recording
Brabender Corp.
Esterline-Angus Co.
Fischer & Porter
Hayes Scientific App.
Norcross Laboratories
Taco Engineering

VISCOSIMETERS, Redwood
American Inst. Co.
Ruehfel Co.

VISCOSIMETERS, Saybolt
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Corning Glass Works
Eitzen Co.
Humboldt Mfg. Co.
Kimble Glass Co.
Monarch Mfg. Wks.
Precision Scientific Co.
Ruehfel Co.
Tagliabue Div.
Zuhr, Inc., Henry

VISCOSIMETERS, Scott
Boekel & Co.
Central Scientific Co.
Precision Scientific Co.
Ruehfel Co.
Sargent & Co.

VISCOSIMETERS, Stormer
Central Scientific Co.
Industro-Scientific Co.
Thomas Co., Arthur H.

VISCOSIMETERS, Ubbelhode
American Inst. Co.
Central Scientific Co.
Fish-Schurman Co.
Precision Scientific Co.
Sargent & Co.
Tagliabue Div.

VISCOSIMETERS, Zahn
General Elec. Co.
Precision Scientific

VISCOSITY REGULATORS (See Controllers, Automatic, Viscosity)

VISCOSITY GAGES
Eitzen Co.
Precision Scientific
Taco Engineering
Visco-Meter Corp.

VISCOSITY TUBES
Cargille, R. P.
Fischer & Porter
Fish-Schurman
Precision Scientific

VOLTAGE ADJUSTERS, AUTOMATIC
Amplifier Co.
General Elec. Co.
Ideal Commutator Dresser
Sherron Metallic
Sola Electric Co.
Sorensen & Co.
Taco Engineering
United Transformer Corp.

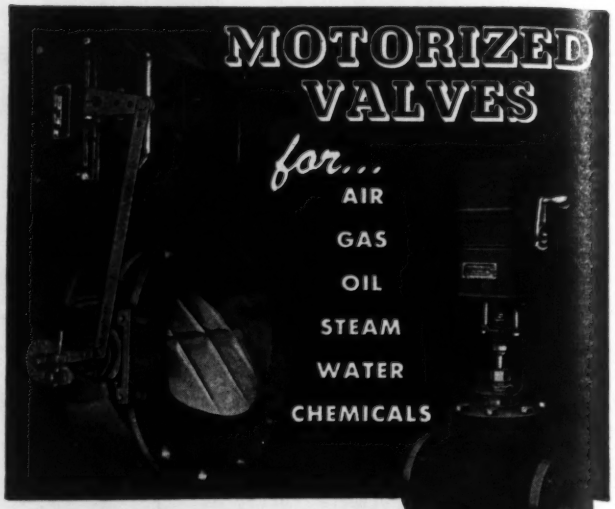
VOLTAGE DETECTORS (See Detectors, Voltage)

VOLTAGE DIVIDERS, Radio Frequency (See Dividers, Voltage)

VOLTAGE, HIGH (above 2300 volts) Indicators
American Radio Co.
Cole Instrument
General Elec. Co.
General Physical Lab.
Ideal Commutator Dresser
Meters, Inc.
Rawson Electrical Inst.
Roller-Smith Co.
Sensitive Research Inst.
Shalleross Mfg. Co.
Sherron Metallic
Taco Engineering
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp

VOLTAGE, HIGH (above 2300 volts) Measuring Devices
American Radio Co.
Associated Research
Barber Labs., Alfred
Cole Instrument
Freed Transformer
General Elec. Co.
International Resistance

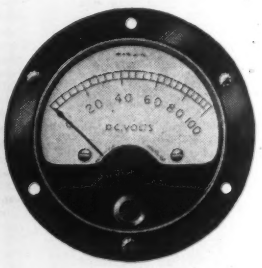
(Cont'd)



The most complete line of motorized valves . . . operate from push buttons or rheostats for remote positioning . . . or automatically from thermostats and other measuring instruments. Standard types for On-Off, Throttling or Proportioning control. Splash-proof, weather-proof, dust-tight, explosion-proof designs available. Write for free Catalog A2 today.

atc AUTOMATIC TEMPERATURE CONTROL CO., Inc.
Logan St. & Germantown Ave. • Philadelphia 44, Pa.

COMPLETELY SELF-CONTAINED IN A 1½" CASE!



MODEL 152

PRECISION MB INSTRUMENT
IN VOLTMETER OR SHUNTED AMMETER RANGES

The basic MB high-precision movement is the smallest produced. It has a *1-inch diameter*, and in a 1½-inch case, there's ample room for MB-designed multipliers. A standard rectifier, or thermocouple for RF type instruments, is also mounted to the base plate in alternating current instruments.

MB instruments are accurate to within 2% of full scale at any point; are sturdily built and securely sealed to withstand hard use and to give long, satisfactory service. Available in round and square shapes. Write for full details.

THE MB MANUFACTURING COMPANY, INC.
331 East St., New Haven 11, Conn.
INSTRUMENT DIVISION

for LINE VOLTAGE STABILIZATION

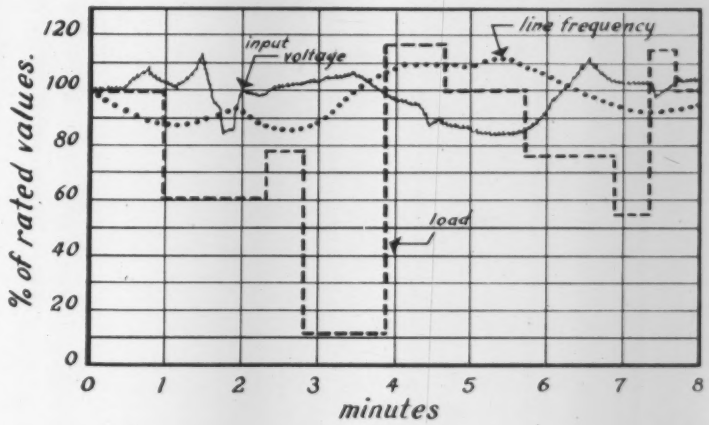
Where the Problem is TOUGH

SORENSEN REGULATORS are designed to give accurate stabilization under a wide variety of unusual conditions.

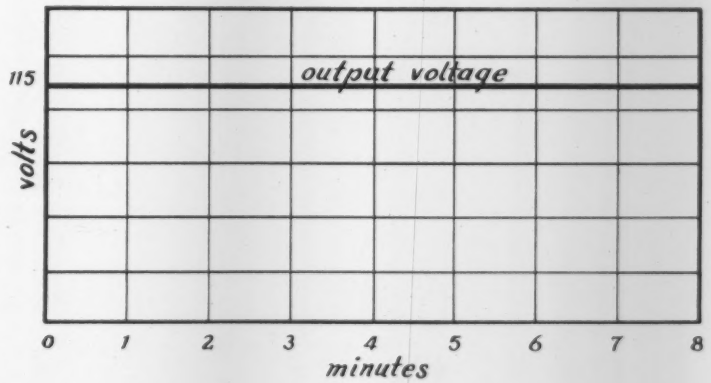
Here are the general characteristics of all SORENSEN REGULATORS:

- Constant output voltage within ±0.2%.
- Input range — 95 to 125 volts.*
- No moving parts — maximum response time of six cycles.
- Minimum harmonic distortion — less than 5%.**
- Unaffected by variations in load from 10% to 100%, frequency ±10%, or lagging power factor.
- Adjustable output voltage.
- For rack and panel or cabinet mounting.

With THESE variations



you get THIS



THESE POPULAR MODELS AVAILABLE FOR IMMEDIATE DELIVERY

MODEL	LOAD RATING	VOLTAGE RATING	NET WEIGHT
250**	250 va.	115	40#
500	500 va.	115 or 230	35#
1000**	1000 va.	115 or 230	63#
1750**	2 kva.	115 or 230	160#
5000–2	5 kva.	230	260#

* for 115 volt models.
** distortion of less than 2% (guaranteed) available in special models.

ALSO AVAILABLE

The INCREVOLT—adjustable line voltage control—can be adjusted to any desired voltage between 0 and 130 volts, accurately, to within ONE TENTH VOLT. Thermally protected—in 5 and 15 ampere sizes.

DC REGULATORS—six, twelve and twenty-eight Volt in capacity of from 5 amps to 15 amps. Well filtered and designed to regulate at accuracy plus or minus 0.5%.

A complete line of specialty transformers for all applications. Varnish impregnated, oil filled, hermetically sealed, or Fosterite treated units can be furnished. Send us your problems concerning transformers, chokes, or reactors.

Write for descriptive literature

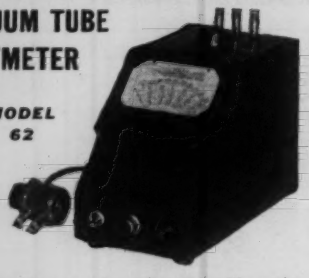
SORENSEN & COMPANY, INC.

375 FAIRFIELD AVENUE, STAMFORD, CONN.

Laboratory Standards

VACUUM TUBE VOLTMETER

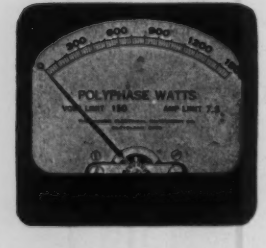
MODEL 62



A compact, accurate voltmeter with push-button selection of five ranges: 1, 3, 10, 30, and 100 volts a.c. or d.c.

MEASUREMENTS CORPORATION
BOONTON NEW JERSEY

HIGHEST HICKOK ACCURACY



WATTMETERS
FREQUENCY METERS
POWER FACTOR METERS
VOLTMETERS
AMMETERS, ETC.

4" Rectangular Cases, Flush or Surface Mounting. With or without illuminated dials. Neat, attractive, easy to mount.

COMPLETE INFORMATION UPON REQUEST

Manufacturers of all sizes and types of Electrical Indicating Instruments

HICKOK
ELECTRICAL INSTRUMENT COMPANY
10514 DUPONT AVE., CLEVELAND, OHIO

VOLTAGE, HIGH (Cont'd)
Radio City Products
Rawson Elec. Inst. Co.
Reiner Electronics
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg.
Triplett Elec. Inst.
Sherron Metallic
Taco Engineering
Westinghouse Elec.
Westinghouse X-Ray Co.
Weston Elec. Inst. Corp.

VOLTAGE, HIGH (above 2300 volts) Testing Devices
American Radio Co.
American Transformer
Associated Research
Cole Instrument
General Elec. Co.
Ideal Commutator Dresser
International Resistance
Miller Co., Bertrand F.
Radio City Products
Raytheon Mfg. Co.
Reiner Electronics
Roller-Smith Co.
Schweitzer & Conrad
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
States Co.
Superior Elec. Co.
Taco Engineering
Thordarson Elec. Mfg.
Triplett Elec. Inst.
United Transformer Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTAGE REGULATORS (See Regulators, Automatic, Voltage)

VOLT-AMMETERS
Am. Elec. Sales Co.
Assembly Products
Associated Research, Inc.
Clough-Brengle Co.
Cole Instrument
Dayton Acme Co.
De Jur-Amsco Corp.
Electronic Development
Electronics, Inc.
Espey Mfg.
Esterline-Angus Co.
General Elec. Co.
Hickok Elec. Inst. Co.
Knickerbocker Dev.
Meters, Inc.
Precision Apparatus Co.
Radio City Products
RCA Manufacturing Co.
Rawson Electrical Inst.
Reiner Electronics
Reliance Instrument Co.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Electric Co.
Sticht Co., Inc.
Supreme Instruments
Taco Engineering
Triplett Electrical Inst.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLT-AMPERE-HOUR METERS
Ferranti Electric, Inc.
General Electric Co.
Westinghouse Elec.

VOLT-AMPERE METERS, REACTIVE
Esterline-Angus Co.
General Elec. Co.
Landis & Gyr, Inc.
Sensitive Research Inst.
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst.

VOLTMETERS, Contact Making
Burton-Rogers Co.
Cole Instrument
(Cont'd)

VOLTMETERS, Contact Making (Cont'd)
De Jur-Amsco
Edison Electrical Controls
Electronic Laboratory
Electric Tachometer Corp.
Electronic Development
Engineering Labs., Inc.
Esterline-Angus Co.
Ferranti Electric, Inc.
General Electric Co.
Geophysical Instrument Co.
Hickok Electrical Inst.
Reliance Instrument Co.
Roller-Smith Co.
Taco Engineering
Triplett Elec. Inst.
Weston Electrical Inst.

VOLTMETERS, Electrostatic
Cambridge Inst. Co.
Cole Instrument
Ferranti Electric, Inc.
General Elec. Co.
Hathaway Inst. Co.
Rawson Electrical Inst.
Sensitive Research Inst.
Sticht Co., Inc.
Taco Engineering

VOLTMETERS, Indicating
Assembly Products
Associated Research
Ballantine Labs.
Boes Co., W. W.
Burlington Inst. Co.
Burton-Rogers Co.
Chicago Indust. Inst.
Clough-Brengle Co.
Cole Instrument
Columbia Elec. Mfg.
Control Corp.
Dayton Acme Co.
De Jur-Amsco Corp.
Electro-Tec Div.
Electronic Development
Electronics, Inc.
Espey Mfg.
Ferranti Electric, Inc.
General Elec. Co.
Hickok Elec. Inst. Co.
J-B-T Insts.
Knickerbocker Dev.
M B Mfg. Co.
Meters, Inc.
Niagara Electrical Inst.
Norton Electrical Inst.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Electrical Inst.
RCA Manufacturing Co.
Readrite Meter Wks.
Reiner Electronics
Reliance Instrument
Roller-Smith Co.
Sensitive Research Inst.
Simpson Elec. Co.
Sticht Co., Inc.
Sun Electric Corp.
Taco Engineering
Triplett Elec. Inst.
Triumph Mfg. Co.
Welch Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

VOLTMETERS, Megohm
Associated Research
Cole Instrument
Daven Co.
Deimhorst Instrument
Electronic Development
Electro Products Lab.
General Radio Co.
Jackson Electrical Inst.
Rawson Electrical Inst.
RCA Manufacturing Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sticht Co., Inc.
Sun Manufacturing
Taco Engineering
Televiso Co.
Triplett Elec. Inst.
Welch Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTMETERS, Micro
Ballantine Labs.
Cambridge Inst. Co.
Cole Instrument
De Jur-Amsco Corp.
General Radio Co.
Hickok Elec. Inst. Co.
Knickerbocker Dev.
Microvolts, Inc.
Rawson Electrical Inst.
Sensitive Research Inst.
Supreme Instruments
Taco Engineering
Televiso Co.
Triplett Electrical Inst.
Welch Scientific
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Micro, Radio Frequency
Ballantine Labs.
Burlington Inst. Co.
Clarke Inst. Corp.
Cole Instrument
Ferris Inst. Corp.
General Elec. Co.
General Radio Co.
Sensitive Research Inst.
Taco Engineering
Triplett Elec. Inst.

VOLTMETERS, Millivoltmeters
Assembly Products
Ballantine Labs.
Bristol Co.
Brown Inst. Co.
Brulington Inst. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Cole Instrument
Dayton Acme Co.
De Jur-Amsco Corp.
Electro-Tec Div.
Electronic Development
Electronics, Inc.
Engelhard, Chas.
Esterline-Angus Co.
Etna Elec. Works
Foxboro Co.
Freed Transformer
General Elec. Co.
Hickok Elec. Inst. Co.
J.B.T Insts.
Knickerbocker Dev.
Marion Electrical Inst.
M B Mfg. Co.
Meters, Inc.
Radio City Products Co.
Rawson Electrical Inst.
RCA Manufacturing
Reiner Electronics
Reliance Instrument
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Elec. Co.
Standard Science Sup.
Sun Manufacturing
Taco Engineering
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Oxide Rectifier
Clough-Brengle Co.
Cole Instrument
De Jur-Amsco Corp.
Electro-Tec Div.
Electronic Development
Electronics, Inc.
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
M B Mfg. Co.
Meters, Inc.
Radio City Products Co.
Reiner Electronics
Roller-Smith Co.
Simpson Elec. Co.
Sun Manufacturing
Supreme Instruments.
Taco Engineering
Triplett Electrical Inst.
Triumph Mfg. Co.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTMETERS, Peak
Barber Labs., Alfred
Clarke Inst. Corp.
Clough-Brengle Co.
Cole Instrument
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
RCA Manufacturing Co.
Rowe Radio Research
Sensitive Research Inst.
Triplett Elec. Inst.

VOLTMETERS, Recording
Bristol Co.
Brush Development
Cambridge Inst. Co.
Engelhard, Chas.
Esterline-Angus Co.
General Elec. Co.
Leeds & Northrup Co.
Roller-Smith Co.
Sticht Co., Inc.
Taco Engineering
Westinghouse Elec.

VOLTMETERS, Thermionic Rectifier
Andrew, Victor J.
Barber Labs., Alfred
Cambridge Inst. Co.
Clippard Inst. Lab.
General Elec. Co.
General Radio Co.
Measurements Corp.
Meters, Inc.
Taco Engineering
Triplett Elec. Inst.

VOLTMETERS, Thermo
Am. Elec. Sales Co.
Anderson Co.
Cambridge Inst. Co.
Cole Instrument
De Jur-Amsco Corp.
Electronic Development
Etna Elec. Works
General Elec. Co.
Hickok Elec. Inst. Co.
M B Mfg. Co.
Meters, Inc.
Rawson Electrical Inst.
Sensitive Research Inst.
Sun Manufacturing
Taco Engineering
Triplett Electrical Inst.
Welch Scientific
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Vacuum Tube
Andrew, Victor J.
Ballantine Labs.
Barber Labs., Alfred
Cambridge Inst. Co.
Clippard Inst. Lab.
Clough-Brengle Co.
Cole Instrument
Dayton Acme Co.
Electronic Development
Electro Products Lab.
Espey Mfg.
Fisher Scientific Co.
Freed Transformer
General Elec. Co.
General Radio Co.
Hewlett-Packard
Hollywood Electronics
Jackson Elec. Inst.
Madison Elec. Prod.
Measurements Corp.
Microvolts, Inc.
Millen Mfg. Co.
Precision Apparatus Co.
Radio City Products Co.
RCA Manufacturing Co.
Reiner Electronics
Rowe Radio Research
Shallcross Mfg. Co.
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Taco Engineering
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Triplett Electrical Inst.
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Victoreen Instrument
Welch Scientific
Weston Elec. Inst. Corp.

ADDITIONAL RANGES TO 30,000 VOLTS

Location of faulty insulation, protection against burnouts provided to high requirements by NEW models.

HYPOT HIGH VOLTAGE INSULATION BREAKDOWN TESTERS

One-man operation. Instantaneous reading on open scale. Complete with burning ground circuits, high voltage test leads, input and ground leads, rubber tired wheels. (Model 406, 0-3000 volt shown.) Send for Bulletins.

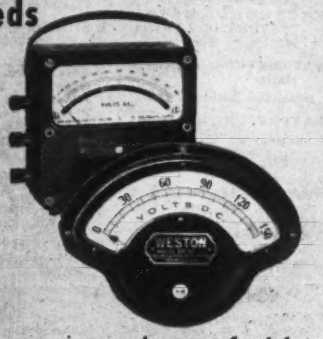
In addition to Models 406-410, 0-3000 volt, HYPOT extended line includes models to 30,000 volts:

Model	*Volts*
532	6,000
542	10,000
552	15,000
557	20,000
562	25,000
567	30,000

Soon available, a hand portable model for testing up to 5,000 volts.

ASSOCIATED RESEARCH, Inc.
233 S. GREEN ST., CHICAGO 7, ILL.
Engineering Service Representatives in All Principal Cities

VOLTMETERS
—and instruments for all electrical measurement needs



All types, sizes and ranges for laboratory, switchboard and maintenance requirements. Consult the WESTON specialist in your vicinity on any instrument problem. Weston Electrical Instrument Corporation, 591 Frelinghuysen Ave., Newark 5, New Jersey.

WESTON *Instruments*

RAWSON MULTIMETERS

Types 501A, 501B, 501C
Accuracy ½ of 1%

Readings from 2 microamperes to 1 ampere on 5 ranges, and 20 microvolts to 1000 volts on 9 ranges.

The word MULTIMETER is our copyrighted trade mark.

Write for bulletins

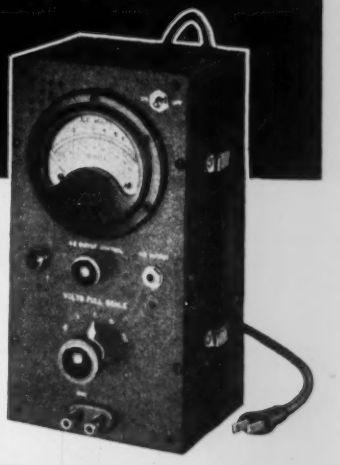
We also supply

Single and Multi-range meters
Thermal Meters for A.C.
Electrostatic Voltmeters
Fluxmeters, Chronoscopes
Electro-Dynamometer Wattmeters
Voltmeters, Milliammeters

RAWSON ELECTRICAL INSTRUMENT COMPANY
112 POTTER ST. CAMBRIDGE, MASS.
Representatives
CHICAGO LOS ANGELES NEW YORK CITY

A Ballantine
ELECTRONIC VOLTMETER
For every requirement

ALL MODELS HAVE THE
SIMPLIFIED LOGARITHMIC SCALE



STANDARD
Model 300

Ideal for the *Accurate* measurement of AC voltages in the Audio, Supersonic, Carrier Current and Television ranges.

Use of Logarithmic voltage scale assures uniform accuracy of reading over whole scale while permitting range switching in decade steps.

Each Voltmeter equipped with an output jack so that the instruments can be used as a high-gain stable amplifier.

Model 304
R-F
VOLTMETER

SPECIFICATIONS

MODEL 300

RANGE—.001 to 100 volts.
FREQUENCY—10 to 150,000 cycles.
ACCURACY—2% at any point on scale.
AC OPERATION—110-120 volts.

MODEL 304

RANGE—.001 to 100 volts.
FREQUENCY—30 c.p.s. to 5.5 megacycles
ACCURACY—0.5 DB.
AC OPERATION—110-120 volts.

MODEL 302

RANGE—.001 to 100 volts
FREQUENCY—5 to 150,000 cycles.
ACCURACY—2% at any point on scale.
DC OPERATION—self-contained batteries.

Send for Bulletin for further description

Model 302
BATTERY
OPERATED

BALLANTINE LABORATORIES, INC.
BOONTON, NEW JERSEY, U. S. A.

PORTER
AIR SCALES

FOR INDICATING, RECORDING OR CONTROLLING

Absolute Weight
Weight Change
Force
Torque

CHARACTERISTICS

Range—Up to 5 tons
Accuracy—±.1%
Sensitivity—±.01%
Scale Length—Up to 100"
Response Speed—15 secs. full scale
Small Space Required
Flexible Tare Adjustment
Simplified Continuous Weighing

GEORGE K. PORTER
Incorporated
HATBORO, PA.

VOLT-OHMMETERS
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Chicago Indust. Inst.
Clippard Inst. Lab.
Clough-Brengle Co.
Cole Instrument
Dayton Acme Co.
De Jur-Amsco Corp.
Electronic Development
Electronics, Inc.
Espey Mfg.
General Elec. Co.
Hickok Elec. Inst. Co.
Jackson Electrical Inst.
Knickerbocker Dev.
Madison Elec. Prod.
Meters, Inc.
Precision Apparatus Corp.
Radio City Products Co.
Rawson Electrical Inst.
RCA Manufacturing Co.
Reiner Electronics
Roller-Smith Co.
Sensitive Research Inst.
Shalleross Mfg. Co.
Simpson Elec. Co.
Superior Instruments
Taco Engineering
Triplett Electrical Inst.
Triumph Mfg. Co.
(Cont'd)

VOLT-OHMMETERS (Cont'd)
Universal Inst. Co.
Welch Scientific
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.

VOLUME CONTROLS
Arca Regulators
Askania Regulator Co.
Carter Radio Div.
Clarostat Mfg. Co.
Daven Co.
General Radio Co.
International Resistance
Mallory & Co.
Poole Manufacturing
Shallcross Controls
Shallcross Mfg. Co.
Utah Radio Prods.

VOLUME INDICATORS Sound
Amplifier Co.
Cole Instrument
Daven Co.
Electronic Development
Electronics, Inc.
General Radio Co.
Meters, Inc.

WATCHES, Chronometer
Bliss & Co.
Burke, Louis
Clebar Watch Co.
Ducommun Co.
Elgin National Watch
Hamilton Watch
Jaeger Watch Co.
Jardur Import Co.
Negus, T. S. & J. D.
Pastor Stop Watch
Roth Bros. Chronometer
Stillman Co.
Waltham Watch

WATCHES, Comparing
Ducommun Co.
Elgin National Watch
Jardur Import Co.
Roth Bros. Chronometer
Waltham Watch Co.

WATCHES, Navigation
Ducommun Co.
Elgin National Watch
Jardur Import Co.
Meridian Instrument
Roth Bros. Chronometer
Waltham Watch Co.

WATCHES, Stop
Aristo Import Co.
Burke, Louis
Central Scientific Co.
Clebar Watch Co.
Ducommun Co.
Elec. Facilities, Inc.
Elgin National Watch
Fish-Schurman Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
Hamilton Watch
Jaeger Watch Co.
Jardur Import Co.
Meylan Stopwatch Corp.
Negus, T. S. & J. D.
Pastor Stop Watch Co.
Pierce Watch Co.
Precision Scientific Co.
Racine & Co., Jules
Roth Bros. Chronometer
Scherr Co., Inc.
Speidel & Co.
Standard Elec. Time
Sticht Co., Inc.
Stillman Co.
Stoelting Co., C. H.
Tagliabue Div.
Testrite Instrument Co.
Waltham Watch
Warren Telechron
White Co.
Zernickow Co., O.

WATCHES, Stop-Electric
Central Scientific Co.
Clebar Watch Co.
Elgin Natl. Watch Co.
Jaeger Watch Co.
Meylan Stopwatch Corp.
Precision Scientific Co.
Roth Bros. Chronometer
Standard Elec. Time
Sticht Co., Inc.
Stillman Co., M. J.
Stoelting Co., C. H.
Tagliabue Div.
Thompson Clock Co.,

WATER ANALYSIS OUTFITS
Howe & French, Inc.
Infilco, Inc.
Taylor & Co., W. A.

WATER BATHS, Constant Temperature
American Inst. Co.
Barnstead Still
Elec. Heat Control App.
McAlear Mfg. Co.
Precision Scientific
Ruska Inst. Corp.
Thwing-Albert Inst. Co.

WATER FEEDERS, AUTOMATIC
Askania Regulator Co.
Bailey Meter Co.
Belfield Co.
Hennsey Co.
Kiely & Muller
Mason-Neilan Regulator
McAlear Mfg. Co.
McDonnell & Miller
Merrit Eng. & Sales Co.
Northern Equip. Co.
Penberthy Injector Co.
Taco Engineering
Watts Regulator Co.

WATER METERS (See Liquid Meters)

WATER METER TESTERS (See Testers, Water Meter)

WATER & SEDIMENT APPARATUS
Barnstead Still
Central Scientific Co.
Davis Reg. Co.
McAlear Mfg. Co.
(Cont'd)

WATER & SEDIMENT APPARATUS (Cont'd)
Precision Scientific Co.
Ruska & Co.
Tagliabue Div.
Thomas Co., Arthur H.

WATTHOUR METERS
General Elec. Co.
Westinghouse Elec.

WATTHOUR METER TESTERS (See Testers, Watthour Meter)

WATTMETERS, Electrostatic
Sensitive Research Inst.

WATTMETER, Indicators
Autocall Co.
Dayton Acme Co.
Electronics, Inc.
General Elec. Co.
Hickok Elec. Inst. Co.
Niagara Elec. Inst.
Norton Electrical Inst.
Rawson Electrical Inst.
Reliance Instrument Co.
Roller-Smith Co.
Sensitive Research Inst.
Taco Engineering
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.

WATTMETER, Recorders
Bristol Co.
Esterline-Angus Co.
General Elec. Co.
Roller-Smith Co.
Sensitive Research Inst.
Westinghouse Elec.

WAVE METERS
Andrew Victor J.
Clarke Inst. Corp.
Espey Mfg.
Federal Telegraph Co.
General Radio Co.
RCA Manufacturing
Sperry Gyroscope Co.

WAX MELTING APPARATUS
Central Scientific Co.
Fisher Scientific Co.
Precision Scientific Co.
Tagliabue Div.

WEATHEROMETER
Atlas Elec. Devices Co.

WEIGHT INDICATORS, Automatic Recording
Exact Weight Scale Co.
Foxboro Co.
Howe Scale Co.
Martin Decker Corp.
Merrick Scale Mfg.
Roller-Smith Co.
Streeter-Amet Co.
Toledo Scale Co.

WEIGHING MACHINES (See various headings under "Scales—")

WEIGHTS, Analytical
Ainsworth & Sons
Becker, Inc., Christian
Central Scientific Co.
Dietert Co.
Exact Weight Scale Co.
Fisher Scientific Co.
Goetze Niemer Co.
Gurley, W. & L. E.
Howe Scale Co.
Newark Scale Works
Pfaltz & Bauer, Inc.
Seederer-Kohlbusch, Inc.
Suter, Alfred
Thomas Co., Arthur H.
Thompson Balance
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Welch Mfg. Co.

WEIGHTS, Avoirdupois
Becker, Inc., Christian
Central Scientific Co.
Exact Weight Scale Co.
Gurley, W. & L. E.
Howe Scale Co.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Suter, Alfred
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

WEIGHTS, Metric
Ainsworth & Sons
Becker, Inc., Christian
Central Scientific Co.
Chicago Apparatus Co.
Exact Weight Scale Co.
Gaertner Scientific Corp.
Gurley, W. & L. E.
Humboldt Mfg. Co.
Keller Mfg. Co.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Suter, Alfred
Thompson Balance
Toledo Scale Co.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Welch Scientific Co.

WEIGHTS, Test (See Weights, Avoirdupois, Metric or Troy)

WEIGHTS, Troy
Becker, Inc., Christian
Central Scientific Co.
Exact Weight Scale Co.
Gurley, W. & L. E.
Howe Scale Co.
Newark Scale Works
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons

WEIGHTS & MEASURES, PRECISION STANDARDS
Becker, Inc., Christian
Gurley, W. & L. E.
Jacobs Bros. Co.
Pfaltz & Bauer, Inc.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry

WEIR METERS (See Flowmeters, Weir)

WELLS, Thermocouple see Tubes, Pyrometer

WIND DIRECTION & VELOCITY INDICATORS
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Friez & Sons
General Elec. Co.
Geophysical Inst. Co.
Green Henry J.
Hastings Inst. Co.
Kenyon Instrument Co.
Southw'n Electronics Labs
Stewart, M. C.
Taylor Inst. Co.
Westinghouse Elec. & Mfg.

WIND DIRECTION & VELOCITY RECORDERS
Elec. Tachometer Corp.
Esterline-Angus Co.
Friez & Sons
Geophysical Instrument
Green Henry J.
Hastings Inst. Co.
Kenyon Instrument Co.
Leeds & Northrup Co.
Mine Safety App. Co.
Stewart, M. C.
Westinghouse Elec. & Mfg.
Zeiss, Inc., Carl

WIND GAGES (See Gages, Wind)

WIRES, Gear Measuring
Acme Industrial
Van Keuren Co.
Size Control Co.

WIRES, Thread Measuring
Acme Industrial
Elgin National Watch
Foxboro Co.
Scherr Co., Inc.
Sheffield Gage
Size Control Co.
Van Keuren Co.

X-RAY CAMERAS, Diffraction
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(See advertisement on page 104)

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Adde & Co., 57 Kennebec St., Portland 2, Maine
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Adel Precision Products Co., Van Owen & Clybourne, Burbank, Calif.
Hydraulic controls & metering pumps

Advance Electric & Relay Co., 1260 W. Second St., Los Angeles 12, Calif.
Relays
(See advertisement on page 84)

Aero Electric Corp., 6916 Romain Ave., Los Angeles 38, Calif.
Connectors

Aero Instrument Co., 3907 San Fernando Rd., Glendale 4, Calif.
Frequency and running time meters

Aero Instrument Co., 3401 Vega Ave., Cleveland, Ohio
Airspeed tubes

Aeroil Burner Co., Inc., Park Ave., at 57 St., West New York, N. J.
Instrument Cleaning Machines

Aerological Developments, Inc., Kelsey Ave. & Heffner Sts., Toledo, Ohio
Scientific & aviation instruments, high altitude test chambers

Aerovox Corporation, New Bedford, Mass.
Capacitors & resistors
(See advertisement on page 8)

Agfa Ansco, Binghamton, N. Y.
Electronic photometer

Ainsworth & Sons, Inc., Wm., 2151 Lawrence St., Denver, Colo.
Scientific instruments; analytical, micro, assay & pulp balances & weights, pocket transits

Aircraft Indicators Co., 742 So. Cooper St., Memphis, Tenn.
Rate of climb indicator

Airdesign Incorporated, 241 Fairfield Ave., Upper Darby, Pa.
Audio-frequency equipment, transformers

Airplane Manufacturing & Supply Corp., 6853 Lankershem Blvd., N. Hollywood, Calif.
Propellor test staves & spark plug testers.

Air-Safe Aircraft Instrument Co., 3722 San Fernando Rd., Glendale 4, Calif.
Navigational & flight instruments

A-Jacks Automatic Regulator Co., 14 N. Clinton St., Chicago 6, Ill.
Controllers: boiler feed, damper, draft & furnace

Allen-Bradley Co., 1326 S. Second St., Milwaukee 4, Wis.
Electric control apparatus

Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y.
Relays, switches & remote control equipment

Allied Radio Corp., 833 W. Jackson Blvd., Chicago 7, Ill.
Amplifiers, Resistors, Condensers, Transformers

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Position indicators, frequency load & phase regulators

All American Tool & Mfg. Co., 1014 W. Fullerton Ave., Chicago 14, Ill.
Vibration fatigue testers

Alco Co., A. S., 1819 Olive St., St. Louis, Mo.
Laboratory supplies

Alpha Instrument Co., 2103 K St., N. W., Washington, D. C.
Meteorological instruments

Alpha-Lux Co., Inc., 192 Front St., New York, N. Y.
Moisture testers

Altender & Sons, Theo., 1219 Spring Garden St., Philadelphia, Pa.
Drawing instruments

American Automatic Electric Sales Co. See Automatic Electric Co.

American Blower Corp., 6000 Russell St., Detroit, Mich.
Manometers

American Cystoscope Makers, Inc., 1241 Lafayette Ave., New York, N. Y.
Bore inspection devices and internal surface inspection devices

American District Steam Co., Bryant St., North Tonawanda, N. Y.
Steam flowmeters

American Gage Co., 143 17th Ave., Paterson 3, N. J.
Profile, ring and snap gages

American Gas Accumulator Co., 1029 Newark Ave., Elizabeth, N. J.
Time delay relays
(See advertisement on page 83)

American Gas Furnace Co., Lafayette, Spring & Elizabeth Sts., Elizabeth F, N. J.
Furnace manufacturer, temperature controllers

American Indicator-Paper Co., 4611 N. Kostner Ave., Chicago 30, Ill.
Chemical indicator papers

American Instrument Co., 8010-8020 Georgia Ave., Silver Spring, Md.
Scientific instruments & materials testing apparatus

American Machine & Metals, Inc.
See Riehle Testing Machine Div.

American Measuring Instruments Corp., 240 W. 40th St., New York, N. Y.
Precision measuring instruments
(See advertisements on pages 21, 40)

American Meter Co., 60 East 42nd St., New York 17, N. Y.
Tinned case & ironcase positive displacement gas & air meters, pressure reducing regulators, meter testing apparatus, indicating, recording & integrating flowmeters, rate volume & liquid level controllers & remote controllers
(See advertisements on pages 26, 46, 82)

American Moistening Co., 260 W. Exchange St., Providence, R. I.
Psychrometers

American Optical Co., Scientific Instrument Div., Eggert & Sugar Rd., Cheetowago, N. Y.
Scientific optical instruments, projection apparatus, testing equipment and optical parts, microscopes, microtomes, refractometers, spectrometers, visual colorimeters, illuminators, delineascopes, magnifiers, and special lenses, prisms and mirrors for industrial and educational purposes.

American Paulin System, 1847 So. Flower St., Los Angeles 15, Calif.
Meteorological instruments

American Radio Co., 611 E. Garfield Ave., Glendale 5, Calif.
Laboratory apparatus
(See advertisement on page 80)

American Telescope Laboratories, Inc., 5864 Hollywood Blvd., Hollywood, Calif.
Astronomical instruments

American Temperature Indicating Co., 1017 Summit St., Toledo 4, Ohio
Electrical resistance thermometers

American Thermo-Electric Co., 63-67 East 8 St., New York 3, N. Y.
Vacuum, separate heater & contact type thermocouples
(See advertisement on page 103)

American Time Products, Inc., 580 Fifth Ave., New York 19, N. Y.
Timing systems
(See advertisement on page 39)

American Transformer Co., 178 Emmet St., Newark, N. J.
Transformers & electrical apparatus including voltage regulators, high voltage testing sets, rectifiers

Ames Co., B. C., Waltham, Mass.
Comparator & dial gages, length measuring devices
(See advertisement on page 40)

Amperite Corp., 561 Broadway, New York 12, N. Y.
Microphones

Amplifier Co. of America, 398 Broadway, New York 13, N. Y.
Amplifiers

Amthor Testing Instrument Co., Inc., 48 Van Sinderen Ave., Brooklyn 7, N. Y.
Physical testing machines
(See advertisement on page 98)

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Balancing machines

Anderson Co., Gary, Indiana
Electrical remote indicators for liquid level, temperature, pressure & line voltage within automotive ranges

Andrew, Victor J., 6429 South Lavergne Ave., Chicago, Ill.
Radio antenna equipment

Annis Company, R. B., 1101 N. Delaware St., Indianapolis, Ind.
Permeameters, balancing machines
(See advertisement on page 54)

Ansonia Clock Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
Timing devices

Apco Mossberg Co., 156 Horton St., Attleboro, Mass.
Torque gages

Applied Research Labs., 4336 San Fernando Rd., Glendale 4, Calif.
Spectrochemical testing apparatus including spectrographs, projection comparators, densitometers, & power source units for arc & spark analysis.

Arca Regulators, Inc., Upper Montclair, N. J.
Hydraulic & air operated controls

Aristo Import Co., Inc., 630 Fifth Ave., New York 20, N. Y.
Stop watches

Arnold Engineering Co., 147 E. Ontario St., Chicago 11, Ill.
Permanent magnets
(See advertisement on page 55)

Arrow-Hart & Hegeman Electric Co., Hartford, Conn.
Magnetic, mercury & relay switches

Ashcraft Automatic Control Co., 1415 Howard St., Chicago 26, Ill.
Automatic controls

Ashton Valve Company, 161 First St., Cambridge, Mass.
Pop, safety & relief valves, pressure gages, gage testers & master pilot & master pressure gages

Askania Regulator Co., 1603 So. Michigan Ave., Chicago 16, Ill.
Automatic control instruments
(See advertisement on page 25)

Assembly Products, Inc., Main & Bell Sts., Chagrin Falls, Ohio
Electrical indicating instruments and accessories

Associated Research, Inc., 431 S. Dearborn St., Chicago, Ill.
Vibrotest insulation testing equipment. Special measuring & testing instruments of electrical nature.
(See advertisements on pages 94, 96, 118)

Atlas Electric Devices Co., 359 West Superior St., Chicago, Ill.
Fade-Ometer, Weather-Ometer, Launder-Ometer
(See advertisement on page 101)

Atlas Valve Co., 282 South St., Newark, N. J.
Regulator valves

Audio Development Co., 2833 13th Ave., Minneapolis 7, Minn.
Transformers, audio frequency equipment

Autocall Co., Shelby, Ohio
Electrical signaling, control & metering devices

Automatic Control Co., 1005 University Ave., St. Paul 4, Minn.
Circuit switches for automatic level controls, automatic timing & sequence controllers

Automatic Electric Sales Corp., 1033 W. Van Buren St., Chicago 7, Ill.
Telephone, signaling & communication apparatus.

Automatic Electric Mfg. Co., Mankato, Minn.
Time switches & interval timers
(See advertisement on page 109)

Automatic Products Co., 2450 North 32nd St., Milwaukee, Wis.
Solenoid valves

Automatic Scale Co., Inc., 591 Hudson St., New York, N. Y.
Automatic scales

Automatic Switch Co., 41 East 11th St., New York 3, N. Y.
Solenoid operated valves & automatic electric control apparatus

Automatic Temperature Control Co., Inc., 17 W. Chelten Ave., Philadelphia 44, Pa.
Timers, time control and specialty engineering. Valves & valve controllers, various types of relays.
(See advertisements on pages 110, 116)

Automatic Time Stamp Co., 139 Atlantic Ave., Boston, Mass.
Time stamps & job recorders

Automatic Valve Controller Co., Box 268, Tulsa 1, Okla.
Automatic valve control.

B

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.
Industrial instruments

Bacon Electric Timer Corp., 4513 Brooklyn Ave., Cleveland, Ohio
Relays, switches & controls

Badger Meter Mfg. Co., 2371 North 30th St., Milwaukee, Wis.
Liquid meters

Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio
Metering & control equipment for power plants & industrial processes. Power plant instruments; boiler meter, meter combustion control operating directly from boiler meter, three-element feed water control, steam superheat control, desuperheating & pressure reducing control. Also metering & control equipment for sewage treatment, water supply & process industries
(See advertisements on pages 18, 25, 28, 30, 40, 57, 75)

Baily Vibrator Company, 1539 Wood St., Philadelphia, Pa.
Optical glass machines, grinding & polishing machines for optical glass

Baird Associates, 33 University Road, Cambridge, Mass.
Specialized physical & optical instruments including complete line of spectrographic & x-ray diffraction equipment.
(See advertisements on page 90)

Baker Compass Co., Melrose, Mass.
Compasses

Baldwin-Southwark Corp., Paschall Post Office, Philadelphia, Pa.
Universal testing machines

Ballantine Labs., Inc., Boonton, N. J.
Artificial ears, electronic voltmeters, sound meters, vibration pickups, throat microphones, telephone receiver test equipment
(See advertisements on pages 48, 119)

Ballauf Mfg. Co., D., 621 H St., N. W., Washington, D. C.
Meteorological instruments

Barber-Colman Co., Rockford, Ill.
Automatic controlling instruments for temperature, humidity, pressure, liquid level, moisture regain, motor-operated valves, solenoid valves, electric power units, damper controllers, voltage sensitive relays, associated switches & relays, fractional H. P. motors, geared motor units & hardness testers.

Barber Laboratories, Alfred W., 34-04 Francis Lewis Blvd., Flushing, L. I., N. Y.
Voltmeters

Barber Tool Die & Gage Co., 5529 Elery St., Detroit 4, Mich.
Special gages

Barbour Stockwell Co., 205 Broadway, Cambridge Mass.
Tachometers

Bark's Mfg. Co., 1105 W. Lawrence Ave., Chicago 4, Ill.
Amplifiers and intercommunication equipment

Barker Tool, Die & Gauge Co., 5529 Elery St., Detroit 11, Mich.
Gages for linear measurements made to customer's specifications

Barnstead Still & Sterilizer Co., Inc., 2 Lanesville Terrace, Boston 31, Mass.
Water stills

Barton Instrument Co., 3500 Union Pacific Ave., Los Angeles 23, Calif.
Flowmeters & gages
(See advertisement on page 40)

Bastian-Blessing Co., 4201 W. Peterson St., Chicago 30, Ill.
Regulating valves

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.
Optical instruments for industrial, scientific & educational use including microscopes, colorimeters, refractometers, photomicrographic & metallographic equipment, contour measuring projector, optical glass & special optical systems

Bear Manufacturing Co., Rock Island, Ill.
Balancing machines

Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Resistors

Beck Co., Harold, 3642 N. Second St., Philadelphia 40, Pa.
Pyrometer controllers
(See advertisement on page 30)

Becker, Christian, 92 Reade St., New York, N. Y.
Precision balances & weights, including analytical, assay, magnetically damped, diamond, specific gravity, dairy, druggists, textile.

Becker, Joseph, 630 W. 168th St., New York, N. Y.

Beckman Co., L., 1609 Canton St., Toledo 2, Ohio
Surveying instruments

Belfield Co., H., Broad & Hamilton Sts., Philadelphia, Pa.
Valves

Bell & Howell Co., 7000 McCormick Rd., Chicago 45, Ill.
Motion picture equipment including cameras, projectors & accessories

Bendix Aviation Corp., Marine Division, 754 Lexington Ave., Brooklyn, N. Y.
Marine Instruments of all types, annunciators, Autosyn motor ship, telegraphs, marine fittings, marine telephone equipment, general industrial safety & signaling equipment

Benwood Linze Co., 1832 Washington Ave., St. Louis, Mo.
Rectifier power units

Berge, J. & H., 145 Hudson St., New York, N. Y.
Laboratory supplies

Berger & Sons, Inc., C. L., 37 Williams St., Roxbury, Boston 19, Mass.
Surveying instruments

Berkley Scientific Co., 1908 Alcatraz Ave., Berkeley 3, Calif.
Ballistic instruments, & spectrometers

Best Scientific Glass App. Wks., 2449 N. Clybourn St., Chicago 14, Ill.

Betts and Betts, 551 West 52nd St., New York, N. Y.
Multiple circuit timers, controls, time delay relays & motor driven & thermostatic interrupters

Biddle Co., James G., 1316 Arch St., Philadelphia, Pa.
Insulation testers, ground testers & ohmmeters, speed-measuring instruments, frequency meters, sliding-contact rheostats
(See advertisement on page 99)

Bin-Dicator Co., 14615 East Jefferson Ave., Detroit 15, Mich.
Automatic bin level indication & control

Binswanger & Co., 645-655 Union Ave., Memphis, Tenn.
Lenses, prisms & filters. Glass of every description

Biological Supply Co., 1176 Mount Hope Ave., Rochester, N. Y.
Biological supplies

Birtcher Corp., 5087 Huntington Dr., Los Angeles 32, Calif.
Electromagnetic relays

Black & Decker Mfg. Co., 715 Pennsylvania Ave., Towson, Md.
Truck scales

Bliley Electric Co., 200 Union Station Bldg., Erie, Pa.
Quartz piezo-electric crystals

Bliss & Co., Inc., John, 84 Pearl St., New York, N. Y.
Marine instruments

Blossom Mfg. Co., 915 Broadway, New York 10, N. Y.
Instrument covers of transparent fabrics

Bock Machine Co., 3618 Colerain Ave., Cincinnati 23, Ohio
Erichsen sheet metal testing machine

Bodine Electric Co., 2254 W. Ohio St., Chicago 12, Ill.
Motors, all types of windings from 1/2000 to 1/6 hp, speed reducer & nonreducer motors
(See advertisement on page 59)

Boehmke Optical Co., 3737 Bird Road, Miami, Fla.
Precision optical manufacturers

Boekel & Co., Wm., 509-519 Vine St., Philadelphia, Pa.
Laboratory apparatus

Boes Co., W. W., Dayton, Ohio
Electrical & navigational instruments for aircraft

Boiler Room Equipment, Inc., 45 West 45th St., New York, N. Y.
Smoke alarms

Boonton Radio Corp., P. O. Box 390, Boonton, N. J.
Radio test instruments
(See advertisement on page 77)

Booth Co., A. E., 210 W. 7th St., Los Angeles 14, Calif.
Portable meter testers
(See advertisement on page 17)

Borden Electric Co., Summit, N. J.
Ground resistance meters

Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Liquid level gages and allied lines

Bostrom-Brady Mfg. Co., Stonewall & Bailey Sts., Atlanta, Ga.
Surveying instruments

Boulin Instrument Corp., 65 Madison Ave., New York 16, N. Y.
Chronometric hand tachometers, wound stroboscopes, electrical stroboscope, speed indicators & portable & stationary tachometers
(See advertisement on page 95)

Bowser & Co., Inc., S. F., 1302 E. Creighton Ave., Fort Wayne, Ind.
Liquid meters

Boyer-Campbell Co., 6540 Antoine St., Detroit, Mich.
Magnifiers

Boylston Steam Specialty Co., 116 W. Illinois St., Chicago, Ill.
Regulating valves

Brabender Corp., Rochelle Park, N. J.
Industrial measuring & control apparatus for plastic & viscous materials; semi-automatic moisture testers

Bradley Laboratories, Inc., 82 Meadow St., New Haven 10, Conn.
Photoelectric cells
(See advertisement on page 79)

Braun Corp., 2260 East 15th St., Los Angeles, Calif.
Chemicals & laboratory supplies

Braun-Knecht-Heimann Co., 576 Mission St., San Francisco, Calif.
Laboratory supplies

Bray Optical Co., 3445 W. 1st St., Los Angeles 4, Calif.
Lenses, prisms & optical instruments
(See advertisement on page 53)

Breeze Corporation, 41 South 6 St., Newark, N. J.
Multiple connectors; radio ignition shielding

Bridgeport Thermostat Co., Inc., Bridgeport 1, Conn.
Metallic bellows and thermostats

Bristol Company, Waterbury 91, Conn.
Recording & automatic controlling instruments for pressure, vacuum, draft, absolute pressure, humidity, liquid level, flow, pH value, temperature (pyrometers & thermometers) & speed. Included are recording barometers, voltmeters, ammeters, wattmeters, dairy instruments, machine operation, motion & operation recorders, control valves, telemetering instruments, process cycle controllers, coordinated process control, time-temperature & time-pressure controllers, potentiometers, air operated & electric controllers & thermal converters. Variations & combinations of these instruments are offered for applications in the various industries & processes. Dilatometers & combustible gas & vapor detectors.
(See advertisements on pages 25, 45, 51, 74, 82, 106)

Brodie Co., Inc., Ralph N., 61st & Lowell Sts., Oakland 8, Calif.
Positive displacement petroleum meters & accessories

Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia 44, Pa.
Electrically actuated pressure & flow controllers

Brookfield Engineering Laboratories, Sharon, Mass.
Synchro-lectric viscosimeter
(See advertisement on page 116)

Brooklyn Thermometer Co., Meriden, Conn.
Thermometers & hydrometers

Brown Corp., W. R., 5728 Armitage Ave., Chicago 39, Ill.
Automatic air regulators

Brown Geophysical Co., P. O. Box 6005, Houston 6, Tex.
Instruments for measuring earth's gravitational field

Brown Instrument Company, 4482 Wayne Ave., Philadelphia 44, Pa.
Thermocouple & optical pyrometers, resistance thermometers, pressure thermometers, pressure gages, flow meters, liquid level gages, hygrometers, CO_2 meters, control systems; electric, air-operated & combined electric & air-operated; combustion safety controls, moisture content recorder & controller & furnace atmosphere recorder
(See advertisements on pages 26, 41, 56, 57, 70, 74, 75, 82, 102, 107)

Brown & Sharpe Mfg. Co., Providence, R. I.
Machine shop instruments

Bruning Co., Inc., Chas., 4754 W. Montrose St., Chicago 41, Ill.
Drawing & surveying instruments

Brush Development Co., 3331 Perkins Ave., Cleveland 14, Ohio
Piezoelectric instruments including laboratory microphones, vibration & fluid pulsation pickups, galvanometers, pen oscillographs, surface finish testers, artificial ears, headphones, phonograph pickups & cutters

Bryant Chucking Grinder Co., Springfield, Vt.
Screw thread gages

Buehler, Adolph I., 228 N. La Salle St. & Wacker Dr., Chicago, Ill.
Metallographic laboratory apparatus

Buehler Ltd., 165 W. Wacker Drive, Chicago 1, Ill.
Metallurgical laboratory equipment

Buffalo Apparatus Corp., 180 Main St., Buffalo, N. Y.
Laboratory supplies

Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y.
Liquid meters for measurement of cold water, hot water, oils, chemicals. Integrating registers, cumulative, setback, or predetermined control.
(See advertisement on page 57)

Buffalo Scale Co., 1200 Niagara St., Buffalo, N. Y.
Scales

Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.
Instruments for indicating, recording, controlling flow, liquid level, pressure, temperature, and weight

Bullard Co., E. D., 275 Eighth St., San Francisco 3, Calif.
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Bunnell & Company, J. H., 215 Fulton St., New York, N. Y.
Relays & switches

Burgess Battery Co., 500 W. Huron St., Chicago, Ill.
Dry batteries

Burke Electric Co., Erie, Pa.
Fractional horsepower motors

Burke, Louis, 41 John St., New York, N. Y.
Stop watches and chronometers

Burling Instrument Co., 251-253 Springfield Ave., Newark 3, N. J.
Temperature controls for laboratories, Industrial processes, furnaces & ovens. (-100° to 1400°F.) Standard tubes or special alloys & ranges.
(See advertisement on page 93)

Burlington Instrument Co., 214½ North 4th St., Burlington, Iowa
Electrical control apparatus

Burrell Technical Supply Co., 1942 Fifth Ave., Pittsburgh 19, Pa.
Scientific instruments & laboratory supplies

Burt Scientific Labs., R. C., 1212 E. Green St., Pasadena, Calif.
Special instruments

Burton Mfg. Co., 3853 N. Lincoln St., Chicago, Ill.
Microscopic accessories & bank & turn indicators

Burton-Rogers Co., 857 Boylston St., Boston, Mass.
Electrical instruments

Bushnell Controls & Equipment Co., 117 W. 9th St., Los Angeles 15, Calif.
Control apparatus

B. W. Controller Corp., 2200 E. Maple Rd., Birmingham, Mich.
Floatless liquid level controls

C

Cadillac Glass Co., 900 W. Cermak Rd., Chicago 8, Ill.
Surface plates

Cady & Co., E. J., 549 W. Washington Blvd., Chicago 6, Ill.
Non destructive testers for physical properties

Calculagraph Co., 300 Sussex St., Harrison, N. J.
Elapsed time indicator

Calibron Products, Inc., 51 Lakeside Ave., West Orange, N J.
Special apparatus

Calkins Co., 934 S. Main St., Los Angeles, Calif.
Laboratory supply house

Callahan & Co., E. J., 14 W. Barre St., Baltimore, Md.
Laboratory supply house

Calta Glass Wks., 2158 Ogden Ave., Chicago, Ill.
Scientific glassware

Cambosco Scientific Co., Waverley, Mass.
Zoological specimens

Cambridge Instrument Co., Inc., Grand Central Terminal, New York, N. Y.
Scientific & industrial instruments
(See advertisements on pages 12, 46, 48, 50, 51, 66, 74, 100, 123)

Cameron Surgical Specialty Co., 666 W. Division St., Chicago, Ill.
Surgical instruments

Campbell Co., J. A., 645 E. Wardlow Rd., Long Beach 7, Calif.
Thermometer wells & automatic controllers

Canadian Radium & Uranium Corp., 630 Fifth Ave., New York 20, N. Y.
Luminous, phosphorescent and fluorescent paints

Cannon Electric Development Co., 3209 Humbolt St., Los Angeles 31, Calif.
Multiple circuit connectors for instruments

Cardwell Mfg. Corp., Allen D., 81 Prospect St., Brooklyn 1, N. Y.
Variable & fixed air condensers

Cargille, R. P., 118 Liberty St., New York 6, N. Y.
Chemical laboratory & photographic devices. Immersion liquids for inspecting glass & quartz

Carson Micrometer Co. Div., Instrument Specialties Co., Inc., 379 Main St., Little Falls, N. J.
Precision micrometer

Carter Radio Div., Precision Parts Co., 213 Institute Place, Chicago 10, Ill.
Relays, resistors, rheostats & switches

Cash Company, A. W., P. O. Box 575, Decatur, Ill.
Combustion control instruments.

Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Scientific instruments & laboratory apparatus

Central Station Steam Co., 2910 E. Woodbridge St., Detroit 7, Mich.
Rotary type condensate meter

Centralab Div., Globe Union Inc., 900 E. Keefe St., Milwaukee 1, Wis.
Capacitors, rheostats, resistors & switches

Chace Co., W. M., 1600 Beard Ave., Detroit 9, Mich.
Thermostatic bimetals

Chaslyn Co., 4527 Ravenswood Ave., Chicago, Ill.
Storage battery testers

Chatillon & Sons, John, 85 Cliff St., New York, N. Y.
Iso-elastic springs

Chelsea Clock Company, 284 Everett Ave., Chelsea, Mass.
Clocks & clock movements

Chemical Rubber Co., 1933 West 114th St., Cleveland, Ohio
Laboratory supplies

Chicago Apparatus Co., 1735 No. Ashland Ave., Chicago, Ill.
Laboratory supplies

Chicago Dial Indicator Co., 544 W. Washington, Chicago, Ill.
Machinist's dial indicators

Chicago Electric Tachometer Co., 800 N. Clark St., Chicago 10, Ill.
Tachometers

Chicago Industrial Inst. Co., 219 W. Chicago Ave., Chicago 10, Ill.
Radio, electronic & industrial test equipment

Chicago Metal Hose Corp., Maywood, Ill.
Metal bellows
(See advertisement on page 19)

Chicago Surgical & Electrical Co., 324 W. Superior St., Chicago, Ill.
Laboratory supplies

Chicago Transformer Co., 3501 W. Addison St., Chicago 18, Ill.
Instrument & power transformers

Cinaudagraph Corp., 2 Selleck St., Stamford, Conn.
Permanent magnets

Cincinnati Clock & Instrument Co., 1113 York St., Cincinnati, Ohio.
Circuit breaker analyzer

Cincinnati Scientific Co., 224 Main St., Cincinnati, Ohio
Laboratory supplies

Cincinnati Time Recorder Co., 1733 Central Ave., Cincinnati 14, Ohio
Time recorders

Claflin Co., Geo. L., 150 Dorrance St., Providence, R. I.
Laboratory supply house

Clapp Inst. Co., Webster, Mass.
Aircraft instruments, thermometers & pressure & vacuum gages

Clare & Co., C. P., 4719 Sunnyside Ave., Jefferson Sta., Chicago, Ill.
Relays, electric counters & electro mechanical specialties

Clark Blast Meter Co., Chas. J., Gladbrook, Iowa
Foundry blast meters & pressure gages

Clark Instrument Co., Inc., 10202 Ford Road, Dearborn, Mich.
Hardness testers

Clark Radio Equipment Corp., 4313 Lincoln Ave., Chicago 18, Ill.
Audio frequency equipment

Clark & Sons Co., Alvan, 58 Day St., West Somerville, Mass.
Optical & astronomical instruments

Clarke Instrument Corp., 910 Jackson St., Silver Spring, Md.
Electrical indicating instruments and accessories

Clarkstan Corp., 11927 W. Pico Blvd., Los Angeles 34, Calif.
Indicating pressure gage

Clarostat Mfg. Co., Inc., 285 North Sixth St., Brooklyn, N. Y.
Resistors
(See advertisement on page 87)

Clay-Adams Co., Inc., 44 E. 23 St., New York 10, N. Y.
Angle & micro centrifuges, compact balances, analytical weights, microscope slides & cover glasses, glass & porcelain ink, tuning forks

Clebar Watch Co., 551 Fifth Ave., New York, N. Y.
Stop watches, timers & chronographs

Cleveland Fuel Engineering Co., 606 Williamson Bldg., Cleveland, Ohio
Furnace controllers, pyrometers & gages

Cleveland Gas Meter Co., 2180 East 65th St., Cleveland, Ohio
Tin case gas meters

Clifford Mfg. Co., 584 E. First St., Boston, Mass.
Metallic bellows & diaphragms; thermostatic assemblies; packless valves

Clippard Instrument Laboratory, Inc., 1440 Chase Ave., Cincinnati 23, Ohio
Electronic apparatus and electrical instruments

Clough-Brengle Co., 6014 Broadway, Chicago 40, Ill.
Electrical instruments, communication testing instruments

Coats Machine Tool Co., Inc., 17 Tudor Lane, Scarsdale, N. Y.
Spring testers

Cochrane Corp., 17th St., Allegheny Avenue, Philadelphia, Pa.
Flowmeters, electrical & mechanical; liquid level meters & controllers; weir meters; pressure & temperature recorders; blow off & relief valves

Cole Co., H., 24 North High St., Columbus, Ohio
Surveying instruments

Cole Instrument Co. Div., Electric Products Service, 1320 S. Grand Ave., Los Angeles 15, Calif.
Electrical & industrial instruments

Coleman Electric Co., Inc., 310 Madison St., Maywood, Ill.
Electrical measuring instruments for technical applications

Coleman Instrument & Mfg. Co., 716 S. Troost Ave., Tulsa 5, Okla.
Oscillographs

Colloid Equipment Co., Inc. 50 Church St., New York, N. Y.
Laboratory apparatus

Colonial Process Supply Co., 136 W. 23 St., New York, N. Y.
Nameplates, dials & trade marks

Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland 14, Ohio
Rheostats, instruments, shunts, switchboards & special electrical equipment

Combustion Control Corp., 77 Broadway, Cambridge, Mass.
Combustion controls

Commerce Pattern Foundry & Machine Co., 2211 Grand River Ave., Detroit, Mich.
Balancing machines

Commercial Research Labs., Inc., 20 Bartlett Ave., Detroit 3, Mich.
Laboratory instruments for automotive, aircraft, railway & allied industries: air flow indicators, direct pressure & piezo-ray engine indicators, fuel flow indicators, magnetic gages, torsional vibration indicators (piezo-ray), recorders (torsiographs) & recording instruments for car performance & riding comfort

Commercial Iron Works, 2424 Porter St., Los Angeles 21, Calif.
Orifice fittings

Communication Measurements Laboratory, 120 Greenwich St., New York 6, N. Y.
Testers, rectifiers, voltage regulators, communication measuring equipment

Compar Instrument Co., 16179 Hamilton Ave., Detroit 3, Mich.
Comparoscope

Comtor Company, 83 Rumford Ave., Waltham 54, Mass.
Precision internal & external comparator-type diameter gages

Conant, George H., 719 Watson St., Ripon, Wis.

Conant Electrical Laboratories, 6500 O St., Lincoln 5, Neb.
Dry disc rectifiers
(See advertisement on page 78)

Concord Radio Corp., 901 W. Jackson Blvd., Chicago 7, Ill.
Amplifiers
(See advertisement on page 14)

Connecticut Telephone & Electric Div., Great American Industries, Inc., Meriden, Connecticut
Electronic devices

Connelly Iron Sponge & Governor Co., 3154 So. California Ave., Chicago, Ill.
Gages & manometers, B T U indicator & H_2S tester

Consolidated Asheroft Hancock Co.
See Manning, Maxwell & Moore, Inc.

Consolidated Engineering Corp., 620 N. Lake Ave., Pasadena 4, Calif.
Geophysical instruments, mass spectrometers, vibration measuring equipment
(See advertisements on pages 65, 101)

Consulting & Engineering Co., Carson St. & Terminal Way, Pittsburgh, Pa.
Combustion controllers

Continental Electric Co., Room 2017, 188 W. Randolph St., Chicago 1, Ill.
Photoelectric tubes & equipment

Continental Equipment Co., Coraopolis, Pa.
Valves

Control Corporation, 718 Central Ave., Minneapolis 14, Minn.
Automatic & remote control equipment

Controls, Inc., Towaco, N. J.
Control valves; motor driven time delay relays; process timing devices

Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill.
Electrical control devices, metal bellows, vapor motors & telephone protective & distributing apparatus

Cook Research Laboratories, L. H., Menlo Park, California
Precision testing instruments for oil industry, oil well cement testing equipment, combustible gas indicators, depth pressure recorders

Coors Porcelain Co., Golden, Colo.
Chemical & scientific porcelain

Corbin Screw Corp., New Britain, Conn.
Tachometers & speedometers
(See advertisement on page 95)

Cornell-Dubilier Electric Corp., So. Plainfield, New Jersey
Mica, dykanol, paper & wet & dry electrolytic capacitors

Corning Glass Works, Corning, N. Y.
Technical glassware

Cramer Co., Inc., R. W., Centerbrook, Conn.
Interval timers, running time meters, time switches, signal control switches, time delay switches
(See advertisement on page 82)

Crosby Steam Gage & Valve Co., 30 Church St., New York, N. Y.
Safety & relief valves, gages, recorders, testers & steam engine indicators

Crystal Research Labs., Inc., 29 Allyn St., Hartford 3, Conn.
Capacitors, quartz products, filters, flats, frequency meters, signal generators, mirrors, oscillators, r-f. oscillators, vitreous silica, time interval apparatus, vibration pickups.

Cuthbert Co., Inc., 322 South Third St., Minneapolis, Minn.
Scientific grain, seed and food testing equipment

Curtin & Co., W. H., 2019 Franklin Ave., Houston, Tex.
Laboratory supplies

Cutler-Hammer, Inc., 315 North 12th St., Milwaukee 1, Wis.
Electric motor control, safety switches, motor driven valve operators, gas calorimeters, gas mixing & stabilizing control, resistors

Cyclotron Specialties Co., Moraga, Calif.
Radioactivity equipment

Designers & Builders of

NAUTICAL INSTRUMENTS

★

SPECIAL MECHANICAL DEVICES

★

SPECIAL MACHINERY

★

INSTRUMENT REPAIRERS

★

EQUIPMENT FOR PROCESSING PRECIOUS METALS

★

JOHN DUSENBERY CO.

150 Pine Street, Montclair, New Jersey

D

Daigger & Co., A., 159 W. Kinzie St., Chicago, Ill.
Laboratory supplies

Daniel Orifice Fitting Co., 3350 U. P. Ave., Los Angeles, Calif.
Orifice fittings

Daven Co., 191 Central Ave., Newark 4, N. J.
Attenuators, calibrating equipment for electrical instruments & resistors

Davis & Co., Inc., Dean W., 549 Fulton St., Chicago, Ill.
Solenoids & transformers

Davis Emergency Equipment Co., Inc., 80 Halleck St., Newark 4, N. J.
Inflammable gas alarms

Davis Regulator Co., 2541 So. Washtenaw Ave., Pilsen Sta., Chicago, Ill.
Valves

Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
Chromium plated gage blocks

Dearborn Glass Co., 2414-44 W. 21 St., Chicago, Ill.
Dial faces Glass: low reflecting surfaces, Flourescent pointers & dials

Dearborn Scientific Co., 1228 W. Kinzie St., Chicago 22, Ill.
Optical flats

Deepfreeze Div., Motor Products Co., North Chicago, Ill.
Subzero industrial chilling equipment from —50 to —120°F.

Defender Automatic Regulator Co., 308 S. 8th St., St. Louis, Mo.
Industrial instruments

De Juhasz, K. J., 730 N. Atherton St., State College, Pa.
Engine indicators and indicator valves

De Jur-Amsco Corp., Shelton, Conn.
Photoelectric exposure meters, electrical, radio & photographic products

Delmhorst, Wm. J., 90 West St., New York, N. Y.
Moisture detectors

Demuth Glass Works, Inc., Wythe Ave. at N. 11th St., Brooklyn, N. Y.

Deming Indicator Div., Garrison Machine Works, Inc., 9 Emily St., Dayton 7, Ohio
Test indicators & dial indicators

Denominator Co., Inc., 261 Broadway, New York
Group counting machines

Denver Fire Clay Co., 2301 Blake St., Denver, Colo.
Specialized industrial control equipment for power plant & processing industries, laboratory specialties

D'Este Co., Julien, 69 A Street, So. Boston, Mass.
Control valves

Detecto Scales, Inc. see Jacobs Bros. Co., Inc.

Detroit Air Meter Co., P. O. Box 1473, Detroit, Mich.
Air flowmeters

Detroit Lubricator Co., 5900 Trumbull Ave., Detroit, Mich.
Automatic controls & equipment for air conditioning

Detroit Tap & Tool Co., 8434 Butler St., Detroit 11, Mich.
Machinists' gages

Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 3, Mich.
Testing machines

Deutschmann Corp., Tobe, Canton, Mass.
Equipment for locating, eliminating, and measuring radio noise; electrolytic, paper dielectric & oil type capacitors
(See advertisement on page 21)

Dial Light Co. of America, Inc., 900 Broadway, New York 3, N. Y.
Dial lights

Dickson Co., 7428 Woodlawn Ave., Chicago, Ill.
Furnace controls

Dietert Co., Harry W., 9330 Roselawn Ave., Detroit 4, Mich.
Sand testing equipment; immersion pyrometers, moisture testers, accessories for spectrographic laboratories

Dietzgen Co., Eugene, 2425 Sheffield Ave., Chicago 14, Ill.
Drafting & surveying instruments.

Dillon & Co., Inc., W. C., 5410 W. Harrison St., Chicago 44, Ill.
Traction dynamometers, tensile machines, thermometers
(See advertisements on pages 35, 95)

Distillation Products, Inc., 755 Ridge Road West, Rochester 13, N. Y.
High vacuum pumps, low vapor pressure fluids & auxiliary equipment

DoAll Company, The, 1301 Washington Ave. South, Minneapolis 4, Minn.
Gages, Brinell hardness testers, precision tools

Doeleam, Inc., 437 Cherry St., West Newton 65, Mass.
Aircraft navigational instruments

Doerr Glass Co., Inc., 500 Peach St., Vineland, N. J.
Chemical glassware

Dongan Electric Mfg. Co., 2987 Franklin St., Detroit 7, Mich.
Transformers

Doolittle Radio, Inc., 7421 Loomis Blvd., Chicago, Ill.
Frequency monitor

Dorr-Patterson Engineering Co., 3362 Wight St., Detroit, Mich.
Physical testing machines

Douthitt Corp., 650 W. Baltimore Ave., Detroit 2, Mich.
Process cameras & diaphragm control for cameras

Dow Corning Corp., Midland, Mich.
Silicone fluids and greases for high and low temperature lubrication of instruments, stop-cock grease, high vacuum grease, lens cement, liquid dielectrics, diffusion pump oils

Drafto Co., Cochranton, Pa.
Drafting machines

Drake Manufacturing Co., 1713 W. Hubbard St., Chicago, Ill.
Dial & signal lights
(See advertisement on page 33)

Driftmeter, Inc., 616 Exchange Bank Bldg., Tulsa, Okla.
Oil well instruments

Dubrovin, John, 2946 N. Kenneth Ave., Chicago, Ill.
Mercurial vacuum gage, absolute type

Ducommun Co., M., 580 Fifth Ave., New York, N. Y.
Coil-spring stopwatches

Du Mont Labs., Inc., Allen B., 2 Main Ave., Passaic, N. J.
Cathode-ray oscillographs, cathode-ray tubes, associated electronic equipment, television control, studio & transmitting equipment

Duncan Electric Mfg. Co., Lafayette, Ind.
A-c. & d-c. watthour meters, service & switchboard types; portable test meters, appliance meters & instrument transformers

Dunn, Inc., Struthers, 1321 Arch St., Philadelphia, Pa.
Relays, timing devices, electric counters, thermostats

Durant Manufacturing Co., 1914 N. Buffum St., Milwaukee 1, Wis.
Counting & measuring machines
(See advertisement on page 32)

Dusenbery, John, 150 Pine St., Montclair, N. J.
Designers and builders of nautical instruments and special mechanical devices
(See advertisement on page 124)

Dwyer Mfg. Co., F. W., 565 W. Washington Blvd., Chicago 6, Ill.
Portable & stationary draft gages, CO_2 indicators & combustion testing sets

E

Eagle Signal Corp., 202 20th St., Moline, Ill.
Industrial control devices, traffic signal controllers & sign flashers

Eastern Engineering Co., 45 Fox St., New Haven, Conn.
Laboratory pumps, stirrers & thermoregulators

Eastern Science Supply Co., 7-9 High St., Brookline, Mass.
Meteorological instruments

Eastern Scientific Co., 51 Bassett St., Providence, R. I.

Eastern Specialty Co., 3617 N. 8th St., Philadelphia, Pa.
Testing equipment for checking & maintenance of all types of electricity meters such as watthour meters, demand instruments, etc. Special apparatus for load survey work.
(See advertisement on page 111)

Eberbach & Son Co., Inc., 200 E. Liberty St., Ann Arbor, Mich.
Laboratory apparatus

Eby, Inc., Hugh H., 18 W. Chelten Ave., Philadelphia 44, Pa.
Relays & radio parts

Echo Electrical Manufacturing Co., 17 W. 11 St., Covington, Ky.
Electronic & mechanical timers, time delay relays

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.
Aircraft electrical & mechanical accessories
(See advertisement on page 3)

Economy Electric Devices Co., 37 West Van Buren St., Chicago, Ill.
Electric meters, watthour & amperehour, for street and electric railways and trolley busses

Edelmann & Co., E., 2332 Logan Blvd., Chicago 47, Ill.
Automotive test instruments

Edison, Inc., Thomas A., Edison Electrical Controls Div., West Orange, N. J.
Sealed-in-glass control devices, including thermostatic switches, fire detection thermostats, & timing relays. Hermetically sealed thermostatic valves. Special control equipment

Edna Brass Mfg. Co., 528 Reading Rd., Cincinnati, Ohio
Gages, liquid level

Elmer & Amend, 635 Greenwich St., New York, N. Y.
Biological & chemical laboratory apparatus & supplies

Eitzen Co., Louis C., 17 W. 60th St., New York 23, N. Y.
Extensometers

Elder, Andrew C., 2712 S. Hill St., Los Angeles 7, Calif.
Dial indicators

Electric Auto-Lite Co., Chrysler Bldg., New York, N. Y.
Pressure & vacuum gages, speedometers, tachometers & thermometers

Electric Eye Equipment Co., Danville, Ill.
Automatic inspection devices

Electric Glass Co., 249 N. 4th St., Philadelphia 6, Pa.
Thermostats
(See advertisement on page 110)

Electric Heat Control Apparatus Co., 507 Fifth Ave., New York, N. Y.
Laboratory ovens

Electric Hotpack Co., Inc., Melrose St. at Cottman Ave., Philadelphia 35, Pa.
Designers and manufacturers of heat control and laboratory equipment
(See advertisement on page 23)

Electric Indicator Co., 21 Parker Ave., Stamford, Conn.
Synchronous motors, position indicators, level controls, signalling devices

Electric Sorting Machine Co., Michigan Trust Bldg., Grand Rapids 2, Mich.
Color analyzers

Electric Speed Indicator Co., 1652 Onondaga, Lakewood, Ohio
Precision electric tachometers & remote position indicators

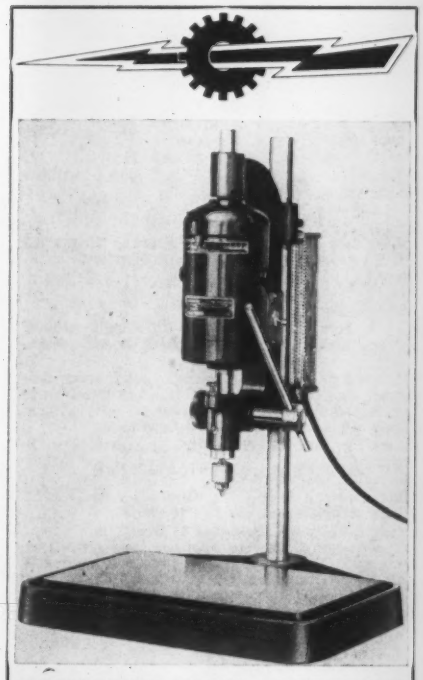
Electric Switch Corp., 1409 Union St., Columbus, Ind.
Mercury switches

Electric Tachometer Corp., 1358 Spring Garden St., Philadelphia, Pa.
Speed indicators & recorders, electric & mechanical counters

Electrical Coil Winding Co., 2736 Saunders St., Camden, N. J.
Magnet & solenoid coils

Electrical Facilities Inc., 4224 Holden St., Oakland, Calif.
Apparatus for electrical measuring & testing, including precision transformers, watthour meter and instrument transformer testing equipment; rectifier apparatus

Electrical Research Products Inc. see Western Electric Co.



ACCURATE, EASY OPERATION
QUICK SET-UP

Spindle speed: 1000-10,000 or 2500-15,000 RPM
Exclusive "Micro-Feed"
Instantly adjustable to any speed within range
Maximum chuck run-out .0001"
Selected speed accurately maintained
Assures minimum breakage of drills .004" to 5/32"

Bulletin 105

THE ELECTRO-MECHANO CO.
261 E. ERIE ST. MILWAUKEE 2, WISC.

Electrical Testing Labs., 80th St. & East End Ave., New York, N. Y.
Electrical testing & inspection

Electrimatic Corp., 2100 Indiana Ave., Chicago, Ill.
Automatic control valves & controls, regulating valves. Pressure, temperature & electrical actuation

Electro Mechano Co., 261 E. Erie St., Milwaukee 2, Wis.
Tachometers, precision drill press
(See advertisement on page 125)

Electro-Medical Laboratory, Inc., Holliston, Mass.
Neurological & allied medical instruments & general electronic apparatus

Electro Products Laboratories, 549 West Randolph St., Chicago, Ill.
Battery eliminators & rectified A.C. devices
(See advertisement on page 72)

Electro-Tec, Division of Rolling & Engraving Mills, Inc., 2451-57 S. LaSalle St., Chicago 16, Ill.
Electrical instruments

Electro-Tech Equipment Co., 119 Lafayette St., New York 13, N. Y.
Ammeters, voltmeters, power analyzers, bridges
(See advertisement on page 14)

Electro-Voice Mfg. Co., 1239 S. Bend Ave., South Bend 24, Ind.
Microphones

Electrocon Corp., 6 Varick St., New York, N. Y.
Vibration measuring instruments & equipment for dynamic balancing of rotating machines

Electronic Development Co., Omaha, Nebr.
Electronic devices and electrical instruments

Electronic Engineers, 611 E. Garfield Ave., Glendale 5, Calif.
Electronic equipment design

Electronics, Inc., 915 Meridian St., S. Pasadena, Calif.
Electrical meters, meter testers & transformers

Electronic Laboratories, Inc., 122 W. New York St., Indianapolis 4, Ind.
Rectifiers & intercommunication systems

Electronic Laboratory, 306 S. Edinburgh Ave., Los Angeles, Calif.
Photo-electric instruments; also photoconductive cells.

Electronic Products Co., Box 204 A R.R. 1, Aurora, Ill.
Electronic devices
(See advertisement on page 109)

Electronic Products Co., 5330 E. Olympic Blvd., Los Angeles 22, Calif.
Glass instruments & apparatus

Electronic Research Laboratory, 232 E. Erie St., Chicago 11, Ill.
Color analysis apparatus

Electrons, Inc. of Delaware, 127 Sussex Ave., Newark, N. J.
Gas-filled & grid-control rectifier tubes

Elematic Equipment Corp., 6046 Wentworth Ave., Chicago 21, Ill.
Pyrometers

Elgin National Watch Co., Elgin, Ill.
Watches, clocks, aircraft instruments, navigational instruments

Ellison Draft Gage Co., 214 West Kenzie St., Chicago 10, Ill.
Manometers, draft gages, oxsats

Emby Products Co., Inc., 1804 West Pico Blvd., Los Angeles, Calif.
Self-generating and selenium type photoelectric cells

Emerson Apparatus Co., 171 Tremont St., Melrose, Mass.
Calorimeters

Engel, Inc., H. C. M., P. O. Box 233, Sidney, N. Y.
Small drills, small turned parts, millstones in sapphire and block grinding discs

Engelhard, Inc., Charles, 233 New Jersey R. R. Ave., Newark 5, N. J.
Industrial instruments
(See advertisements on pages 48, 75)

English, R. E., 1283 Sargent Ave., St. Paul 5, Minn.
Optical flats & precision lenses

Engineering Laboratories, Inc., 705 Kennedy Bldg., Tulsa, Okla.
Seismic exploration equipment, vibration detectors, petroleum engineering devices, signalling equipment

Eppley Laboratory Inc., 12 Sheffield Ave., Newport, R. I.
Thermopiles, pyrheliometers & standard cells for both industrial & laboratory use
(See advertisements on page 22 & Inside Front Cover)

Equipoise Controls, 100 Stevens Ave., Mount Vernon, N. Y.
Thermometers
(See advertisement on page 1)

Ermastat Co., 1825-39 Wylie St., Philadelphia, Pa.
Electric motor overload protectors

Erie Resistor Corp., 644 West 12th St., Erie, Pa.
High frequency & molded resistors

Erwin Co., O. E., 1274 Augusta Blvd., Chicago, Ill.

Espey Mfg. Co., 305 E. 63 St., New York, N. Y.
Signal generators, audio oscillators, test equipment, radio receivers, transmitters, electronic devices.

Ess Instrument Co., 96 S. Washington Ave., Bergenfield, N. J.
Combustion indicators & recorders, visual & electric eye smoke indicators, flame failure alarms, sensitive relays & special electric eye indicators

Esterline-Angus Co., Inc., P. O. Box 596, Indianapolis 6, Ind.
Graphic recording & contact-making electrical instruments, time, speed, condensate purity, pressure & vacuum recorders, telemeters & portable current transformers

Etched Products Corp., 39-01 Queens Blvd., Long Island City, N. Y.
Dials, scales & panels

Everson Mfg. Co., 214 W. Huron St., Chicago, Ill.
Chemical feeders

Exact Weight Scale Co., 944 West 5th Ave., Columbus 8, Ohio
Over-and-under weight scales & indicators for industrial purposes

Executone, Inc., 415 Lexington Ave., New York 17, N. Y.
Intercommunicating systems, vote paging systems, sound systems for office, plant, military & marine

F

Faichney Instrument Corp., Watertown, N. Y.
Laboratory thermometers

Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.
Scales

Falstrom Co., Main Ave. & D. L. & W. R. R., Passaic, N. J.
Steel instrument panels, panel board assemblies, cubicles, totally enclosed weather & vermin proof instrument enclosures & steel cabinets

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Calipers for checking roll diameters & gear tooth comparators

Fassett Co., Inc., C. M., W. 21 Main Ave., Spokane 8, Wash.
Laboratory supplies

Fast & Co., John E., 3105 N. Crawford St., Chicago 41, Ill.
Capacitors

Fecker, J. W., 2016 Perrysville Ave., N. S., Pittsburgh, Pa.
Astronomical instruments
(See advertisement on page 61)

Federal Anti-Capacity Switch Corp., 1200 Niagara St., Buffalo, N. Y.
Anti-capacity switches

Federal Pneumatic Systems, Inc., 127 N. Dearborn St., Chicago, Ill.
Particle size classifiers

Federal Products Corp., 1144 Eddy St., Providence, R. I.
Precision measuring instruments
(See advertisement on page 42)

Federal Telegraph Co., Inc., 200 Mt. Pleasant Ave., Newark 1, N. J.
Radio transmitting and direction finding equipment, transmitting tubes, field intensity meters, high speed engine indicators

Federal Tool Corporation, 408 North Leavitt St., Chicago, Ill.
Gage handles

Fee and Stemwedel, Inc., 2210 Wabansia Ave., Chicago 47, Ill.
Dial type thermometers, barometers, humidity indicators & allied products, field glasses & binoculars

Fellows Gear Shaper Co., Springfield, Vt.
Gear checking machines & involute measuring machines

Felsenthal & Sons, G., 4110 W. Grand Ave., Chicago 51, Ill.
Dial faces & pointers, name plates, instruction plates & computing scales

Fenwal, Inc., 3 Main St., Ashland, Mass.
Industrial thermostats
(See advertisement on page 31)

Ferner Co., R. Y., 131 State St., Boston 9, Mass.
Precision instruments
(See advertisements on pages 34, 58)

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York, N. Y.
Electrical instruments

Ferris Instrument Corp., Boonton, N. J.
Laboratory & production testing equipment, radio noise & field strength meters & special electrical instruments

Fidelity Machine Co., 3906 Frankfort Ave., Philadelphia, Pa.
Abrasion testers

Field Electrical Instrument Co., 2432 Grand Concourse, New York, N. Y.
Electrical instruments

Fink-Roselieve Co., Inc., 109 W. 64th St., New York, N. Y.
Thermometers

Fischer & Porter Co., 37 County Line Road, Hatboro, Pa.
Rotameters, sight flow meters, automatic flow controllers, precision optical cells, precision bore glass tubing, & special precision glass apparatus.

Fish-Schurman Corp., 230 East 45 St., New York 17, N. Y.
Scientific instruments, optical, technical & scientific glassware & porcelain
(See advertisements on pages 49, 52)

Fisher Furnace Co., 5335 N. Wolcott Ave., Chicago 40, Ill.
Furnaces & ovens

Fisher Governor Co., Marshalltown, Iowa
Motor control valves & regulators

Fisher-Pierce Co., 70 Ceylon St., Boston 21, Mass.
Photoelectric controls, relays, timers

Fisher Research Laboratory, 1961 University Ave., Palo Alto, Calif.
Leak detector & pipe finder. Electronic equipment

Fisher Scientific Co., 711 Forbes St., Pittsburgh 19, Pa.
Standard & special equipment & instruments for chemical, biological & metallurgical laboratories

Fleischhauer & Son, F., 89-36 187 Place, Hollis, L. I., N. Y.
Instrument makers
(See advertisement on page 108)

Flett Laboratory, 17 Madison Ave., Lansdowne, Pa.
Laboratory apparatus, scientific cameras, counters, photometers

Fluid Meters, Inc., 44 Wall St., Room 1101, New York, N. Y.
Positive displacement meters, 1/10 to 8 gallons per hour with gravity pressures

Ford Motor Company, 3674 Schaefer Rd., Dearborn, Mich.
Johansson gage blocks & accessories such as parallels, adjustable holders, scribers, straight edges, center points, sine bars

Ford Regulator Valve Co., 403 Broome St., New York 13, N. Y.
Regulating valves

Foster Engineering Co., 109 Monroe St., Newark 1, N. J.
Control valves

Fox Munitions Corp., 21st & Arch Sts., Philadelphia, Pa.
Gages & gaging fixtures
(See advertisement on page 10)

Foxboro Co., 46 Neponset Ave., Foxboro, Mass.
Indicating, recording & controlling instruments for pressure, temperature, humidity, level & flow
(See advertisement on page 10)

Freas Glass Works, Francis L., 146 E. 9th St., Conshohocken, Pa.
Hydrometers, thermometers & glass instruments

Fredericks Co., George E., Bethayres, Pa.
Glass instruments & apparatus
(See advertisement on page 115)

Freed Transformer Company, Inc., 72 Spring St., New York 12, N. Y.
Transformers

Frick Co., Inc., Waynesboro, Pa.
Float valve controls & electric controls, refrigerating & air conditioning machinery

Fried & Lustig, Inc., 31 Union Square, New York 3, N. Y.
Thermometers

Friez & Sons, Division, Julien P., Bendix Aviation Corp., Taylor Ave. at Loch Raven Blvd., Towson, Md.
Temperature & humidity controls, gas & stoker controls, damper motors, electrical relays, temperature & humidity indicators & recorders, psychrometers, draft gages, anemometers, CO_2 analyzers

Fuess, Inc., R., 39 West 60th St., New York 23, N. Y.
Scientific instruments

Fuller Co., 110 Bridge St., Catasauqua, Pa.
Bulk material level controllers

Fulton Sylphon Co., Knoxville 4, Tenn.
Temperature & pressure regulators, sylphon bellows; thermostat assemblies; diesel controls; automobile thermostats; air conditioning controls

Furnas Electric Co., 300 McKee St., Batavia, Ill.
Pressure controls

G

Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.
Measuring instruments including toolmaker microscopes, micrometer slides, micrometer microscopes, comparators, interferometers, spherometers, microscopes & telescopes for observation & inspection; time recording devices including chronographs & special devices; dividing machines for engraving linear & circular scales; goniometers; spectroscopic equipment & accessories
(See advertisement on page 60)

Gallien, R. P., 220 W. 5 St., Los Angeles 13, Calif.
Instrument lathes & tools

Gannon Company, Russell R., 715 Gwynne Bldg., Cincinnati 2, Ohio

Garner Electronics Corp., 1100 Washington Blvd., Chicago 7, Ill.
Frequency meters and slide projectors

Gas Appliance Specialties Co., 57th St., bet. Northern Blvd. & 32nd Ave., Woodside, New York, N. Y.
Gas regulators

Gates & Co., Geo. W., Franklin Sq., Long Island City, N. Y.
Light sources & etching compounds for glass & quartz

Gauthier, Donat A., 7408 Poe Ave., Detroit 6, Mich.
Gasoline measuring devices & automobile service station testers

Geier & Bluhm Inc., 607 River St., Troy, N. Y.
Mechanical devices & spirit level vials
(See advertisement on page 53)

Genales, Andrew, 29 Second Ave., Nyack, N. Y.
Toolroom test indicators

General Biological Supply House, Inc., 761 East 69th Pl., Chicago, Ill.
Biological laboratory supplies

General Combustion Corp., 2218 W. Lake St., Chicago, Ill.
Combustion equipment

General Control Co., 1200 Soldiers Field Rd., Boston, Mass.
Electrical switches

General Controls Co., 801 Allen Ave., Glendale 1, Calif.
Pressure, temperature & flow control valves
(See advertisement on page 127)

General Electric Co., 1 River Rd., Schenectady 5, N. Y.
Electrical instruments & meters

General Electric Co., 1001 Wolf St., Syracuse, N. Y.
Electronic equipment

General Electric Co., Lamp Dept., Nela Park, Cleveland 12, Ohio
Lighting sources

General Electric X-Ray Corp., 2012 Jackson Blvd., Chicago, Ill.
Medical, dental & industrial X-ray apparatus, accessories & suppliers

General Engg. & Model Works, 421 N. Braddock Ave., Pittsburgh, Pa.
Gages & precision measuring instruments for checking threaded tubular products

General Luminescent Corp., 732 Federal St., Chicago 5, Ill.
Luminous paint, fluorescent dials & pointers, radioactive dials & pointers, phosphorescent dials & pointers

General Magnetic Corp., 2126 E. Fort St., Detroit 7, Mich.
Permanent magnets

General Physical Laboratory, 509 Fifth Ave., New York 17, N. Y.
Special light sources

General Radio Co., 30 State St., Cambridge, Mass.
Radio & electrical measuring instruments for laboratory & industrial use: stroboscopes, noise measuring equipment, measuring & test equipment for electrical communication systems

General Regulator Corp., 165 Broadway, New York, N. Y.
Combustion, draft, liquid level & pressure controls

General Sales & Products Corp., 45 Mohawk St., Cohoes, N. Y.
Shut-off valves

General Scientific Corp., 4829 So. Kedzie Ave., Chicago, Ill.
Lenses & photoelectric cells

General Television Corp., 70 Brookline Ave., Boston, Mass.
Ionization vacuum gages

General Test Equipment Co., 38 Argyle Park, Buffalo 9, N. Y.
Pen size radio signal source, also special apparatus

Geophysical Instrument Co., Key Blvd. & Nash St., Arlington, Va.
Instruments & accessories for prospecting for oil, minerals, water, bedrock; also equipment for making measurements in wells

G. & G. Precision Works, Inc., 5-33 Forty-eighth Ave., Long Island City 1, N. Y.
Mechanical, optical & electrical precision instruments

Gilmore, E. R., Box 5718, Homewood Sta., Pittsburgh 8, Pa.
Gas leak stethoscopes

Gisholt Machine Co., Madison, Wis.
Static & dynamic balancing machines

Glass & Bro., Harry H., 131 Duane St., New York 13, N. Y.
Dials, pointers, instrument scales, name plates

Gleason-Avery, Inc., 27 Clark, Auburn, N. Y.
Furnace controls

Glendale Optical Co., 249 Pennsylvania Ave., Brooklyn, N. Y.
Prisms, lenses, flats, mirrors, verticles & optical units.

Globe Industries, Inc., 125 Sunrise Place, Dayton, O.
Aircraft instrument testing equipment, aircraft interval timing instruments, aircraft photo equipment, automatic control instruments

Globe Phone Mfg. Corp., Reading, Mass.
Pipe locating equipment, leaky valve locators, hearing aids, secret phone or listening equipment for government investigating agencies

Globe Tool & Engg. Co., 410 Davis Ave., Dayton, Ohio
Dynamic balancing equipment

Glogau & Co., 1632 Rand McNally Bldg., Chicago 3, Ill.
Calipers

G-M Laboratories, Inc., 4326 N. Knox, Chicago, Ill.
Photoelectric cells, photoelectric relays, slide wire rheostats, galvanometers, laboratory stands & clamps

G. M. Manufacturing Co., 248 Lafayette St., New York, N. Y.
Thermometers, hydrometers, psychrometers, hygrometers

Goerz American Optical Co., C. P., 317 East 34th St., New York 16, N. Y.
Photographic lenses, optical prisms & flats, and other optical units to specification

Goetze Niemer Co., 808 Francis St., St. Joseph 1, Mo.
Laboratory supply house

Gogan Machine Corp., 1440 E. 55 St., Cleveland, Ohio
Automatic hardness testers

Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif.
Surveying instruments, pipe locators, leak detectors

Goodrich Co., B. F., 450 South Main St., Akron, Ohio
Vibration absorbers

Gordon Co., Claud S., 3000 S. Wallace St., Chicago 16, Ill.
High temperature equipment accessories, such as thermocouples, thermocouple wire, lead wire, insulators
(See advertisement on page 75)

Gorrell & Gorrell, Haworth, N. J.
Equipment for biological & psychological work

Gotham Instrument Co., 149 Wooster St., New York 12, N. Y.
Indicating, dial & recording thermometers
(See advertisement on page 9)

Gotham Scientific Co., 106 Water St., New York, N. Y.
Laboratory supplies

Gothard Mfg. Co., 1355 N. 9 St., Springfield, Ill.
Dial lights

Gow-Mac Instrument Co., 22 Lawrence St., Newark, N. J.
Thermal conductivity gas analyzers & gas analysis cells
(See advertisement on page 46)

Grammes & Sons, L. F., Allentown, Pa.
Metal stamps & wire formings

Graver Tank & Mfg. Co., Inc., East Chicago, Ind.
Automatic proportioning feeders

Gray Instrument Co., 64½ W. Johnson St., Philadelphia, Pa.
Scientific instruments

Green, Henry J., 1191 Bedford Ave., Brooklyn 16, N. Y.
Meteorological instruments

Greene Bros. Inc., 1810 Griffin St., Dallas, Texas
Laboratory Supplies

Greenfield Tap & Die Corp., Greenfield, Mass.
Machine shop gages

Greiner, Inc., Emil, 55 Vandam St., New York, N. Y.
Laboratory Supplies

Griebel Co., E., 8 Wayne St., Carbondale, Pa.
Thermometers, hydrometers, chemical & laboratory glassware

Griner Co., A. J., 417 East 13th St., Kansas City, Mo.
Laboratory supplies

Grove Regulator Co., 1729 Poplar St., Oakland, Calif.
Pump governors, pressure reducing & back pressure regulators for gas or liquid pressures to 6000 lbs.

Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago, Ill.
A-c. and d-c. relays
(See advertisement on page 5)

Gulow Corp., 62 William St., New York 5, N. Y.
Variable voltage transformers

Gump Co., B. F., 435 S. Clinton St., Chicago, Ill.
Scales

Gurley, W. & L. E., 514 Fulton St., Troy, N. Y.
Surveying & allied engineering instruments, paper testing & aeronautical navigation instruments & standard weights & measures

H

Hagan Corp., Hagan Bldg., Pittsburgh 30, Pa.
Combustion control equipment

Hagedorn Engineering Co., 8162 Beverly Blvd., Los Angeles, Calif.
Aircraft instruments

Halldorson Co., 4500 Ravenswood Ave., Chicago, Ill.
Laboratory transformers

Halliburton Oil Well Cementing Co., Duncan, Okla.
Oil well surveying instruments

Hamilton Mfg. Co., Two Rivers, Wis.
Laboratory furniture

Hamilton Watch Co., Lancaster, Pa.
Chronometers & watches

Hankscraft Co., 1007 E. Washington Ave., Madison, Wis.
Timers

Hammel-Dahl Co., 243 Richmond St., Providence, R. I.
Automatic control valves
(See advertisement on page 113)

Hanlon-Waters Div., McAlear Mfg. Co., 1901 S. Western Ave., Chicago, Ill.
Pressure & level controls, time cycle controllers

Hannifin Mfg. Co., 621 So. Kolmer Ave., Chicago, Ill.
Valve operating devices

Hanovia Chemical & Mfg. Co., 90 Chestnut St., Newark 5, N. J.
Quartz mercury arc lamps

Hardwick, Hindle, Inc., 40 Herman St., Newark 5, N. J.
Resistors

Hart Manufacturing Co., 110 Bartholomew Ave., Hartford, Conn.
Thermostats, remote control switches, magnetic relays, heater switches, motor control switches, mercury tube relays

Hart Mfg. Co., R. E., 416 Ward Bldg., Battle Creek, Mich.
Production counters

Hart Moisture Gauges, Inc., 126 Liberty St., New York, N. Y.
Kaydel moisture gages.
(See advertisement on page 97)

Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Electronic apparatus

Hasler-Tel Co., 30 Vesey St., New York, N. Y.
Speed indicators, portable, chronometric

Hastings Instrument Co., Hampton, Va.
Consulting instrument engineers, special developments

Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.
Instruments & apparatus for electrical & mechanical measurements & control.

Hausser & Son, C. A., 6040 Belfield Ave., Philadelphia, Pa.

Hawk Tool & Engineering Co., 7663 Epworth Blvd., Detroit 4, Mich.
Controllers & testing devices

Haydon Mfg. Co., A. W., 111 W. Main St., Waterbury 32, Conn.
Relays and timers

Hayes Scientific Appliances, 202 N. Broadway, Urbana, Ill.
Scientific instruments

Haynes Stellite Co., Kokomo, Ind.
Instrument pivots

Hays Corp., P. O. Box 299, Michigan City, Ind.
Combustion instruments & automatic combustion controls
(See advertisements on pages 27, 42, 46, 48)

Hayward, H. N., 612 W. Oregon St., Urbana, Ill.
Tachometer Testers

GENERAL CONTROLS

MANUFACTURERS of AUTOMATIC PRESSURE, TEMPERATURE AND FLOW CONTROLS

- ALL GAS CONTROLS
- SOLENOID VALVES
- THERMOSTAT CONTROLS
- GAS REGULATORS
- STRAINERS : RELAYS
- TRANSFORMERS : SWITCHES
- MOTOR OPERATED VALVES
- REFRIGERATION VALVES
- AIRCRAFT CONTROLS, ELECTRIC
- INDUSTRIAL VALVES
- THERMOVALVES
- PILOT BURNERS
- AUTOMATIC SAFETY PILOTS
- HI-LOW-OFF VALVES
- GAS ACTUATED PACKAGE SETS
- 100% SHUT-OFF VALVES
- GOVERNOR TYPE VALVES
- LOW PRESSURE GAS VALVES
- MAGNETIC GAS VALVES
- PILOT GENERATORS

For complete specifications on motor-operated and other automatic controls write for the new 1946 Catalog 52C or contact Factory Branch or Distributor near you.

GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE, CALIFORNIA

Factory Branches: PHILADELPHIA . ATLANTA . BOSTON . CHICAGO . KANSAS CITY . NEW YORK . DALLAS . DENVER . DETROIT . CLEVELAND . HOUSTON . SAN FRANCISCO . SEATTLE . PITTSBURGH

Distributors in Principal Cities

Hayward Optical Glass Co., Inc., 6110 Atlantic Blvd., Maywood, Calif.
Optical parts, filters & prisms
(See advertisement on page 60)

H-B Instrument Co., Inc., 2518 N. Broad St., Philadelphia 32, Pa.
Thermometers & hydrometers, remote control equipment

HD Electric Co., 100 W. Monroe St., Chicago, Ill.
Split core ammeters

Hebler Co., W. O., Central at Long Ave., Hillside, N. J.
Electrical gas analyzers

Heil Corporation, 216 S. 4 St., St. Louis, Mo.
Laboratory Supplies

Helland Research Corp., 700 Club Bldg., Denver, Colo.
Geophysical instruments, photoflash synchronizers, gas detectors, oscillographs, strain gages, vibration detectors, recording cameras & industrial instruments
(See advertisement on page 65)

Heise Bourdon Tube Co., 275 Noble Ave., Bridgeport, Conn.
Bourdon tube devices
(See advertisement on page 38)

Helicold Gage Div., American Chain & Cable Co., Inc., Bridgeport 2, Conn.
Bourdon tube gages & pressure indicators
(See advertisement on page 47)

Helipot Corp., 1011 Mission St., South Pasadena 8, Calif.
Rheostats, voltage dividing resistors
(See advertisement on page 71)

Hellige, Inc., 3718 Northern Blvd., Long Island City, N. Y.
Scientific instruments, laboratory & bacteriological supplies

Henderson & Co., H. B., East Liverpool, Ohio
Pyrometric cones

Henschel & Co., Inc., John, 105 E. 29th St., New York, N. Y.
Drawing instruments

Henson Co., Fred C., 3311 E. Colorado St., Pasadena, Calif.
Electroscope
(See advertisement on page 35)

Henszey Co., Watertown, Wis.
Feed water meters, flow indicators continuous blowdown, heat exchangers and boiler feed regulators. Also meters and flow indicators for corrosive chemicals

Herkimer Tool & Model Works, 119 George St., Herkimer, N. Y.
Sine bars & gaging fixtures

Herman Stone Co., 324 Harries Bldg., Dayton 2, Ohio
Precision granite surface plates.

Hetherington & Berner, 701 Kentucky Ave., Indianapolis, Ind.
Fluidometers

Heusser Instrument Mfg. Co., 134 West Second South St., Salt Lake City, Utah
Analytical balances

Hewlett-Packard Co., 395 Page Mill Road, Palo Alto, California
Electronic equipment

Heyman Co., 157 Chamber St., New York, N. Y.
Inspection Instruments

H & H Thermostats, Inc., 682 Broadway, New York, N. Y.
Altimeters, recording thermometers, recorder ink for extreme temperatures

Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio
Electric indicating instruments
(See advertisements on pages 14, 37, 118)

Higgins Co., Charles F., RFD 2, Box 61, So. Portland, Me.

Hoffman Co., S. O., 835 Howard St., San Francisco, Calif.
Bolometers

Hoke, Inc., 148 S. Dean St., Englewood, N. J.
Regulators

Hollywood Electronics Div., Megard Corp., 1601 S. Burlington St., Los Angeles, Calif.
Electrical instruments, oscillators & amplifiers

Holtzer-Cabot Electric Co., 125 Amory St., Boston, Mass.
Fractional Horsepower Motors

Hopp Press, Inc., 460 W. 34 St., New York, N. Y.
Nameplates, dial faces, scales, instruction plates
(See advertisement on page 33)

Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8, Mich.
Thermo-couples, heating elements, pyrometers & electric furnaces

Howard Clock Products, Inc., 256 Charles St., Waltham, Mass.
Observatory & seismological clocks.

Howe & French, Inc., 99 Broad St., Boston 10, Mass.
Laboratory supplies

Howe Scale Co., Rutland, Vt.
Scales

Humboldt Mfg. Co., 2014 N. Whipple St., Chicago 47, Ill.
Cement & concrete testers

Hunt & Son, Inc., C. B., Salem, Ohio
Valves & valve operating devices.

Hydraulic Div., New York Air Brake Co., 420 Lexington Ave., New York, N. Y.
Hydraulic control systems

Hydraulic Press Co., Mount Gilead, Ohio
Pressure controls

Hy Ef Electrical Products Mfg. Co., 1515 West Pico, Los Angeles, Calif.
Automobile service station instruments

I

Ideal Commutator Dresser Co., 1420 Park Ave., Sycamore, Ill.
Insulation testers & revolution counters

Ideal Laboratory Tool & Supply Co., P.O. Box 193, Cheyenne, Wyo.
Aircraft instrument test apparatus, sensitive needle valves
(See advertisements on pages 15, 97)

Illinois Engineering Co., Racine Ave. & 20th Pl., Chicago, Ill.
Regulating valves

Illinois Testing Laboratories, Inc., 142 West Hubbard St., Chicago, Ill.
Indicating pyrometers, resistance thermometers, pyrometer controllers, air velocity meters, metal detectors.
(See advertisement on page 73)

Illinois Tool Works, 2501 N. Keeler Ave., Chicago, Ill.

Impact Register Co., 315 So. Neil St., Champaign, Ill.
Instruments for determining and recording impacts received by railroad cars and riding qualities of railroad cars, automobiles

Indiana Steel Products Co., 6 N. Michigan Ave., Chicago 2, Ill.
Instrument magnets

Industrial Condenser Corp., 1725 W. North Ave., Chicago 22, Ill.
Oil, paper & electrolytic capacitors

Industrial Engineering Corp., Evansville, Ind.
Relays

Industrial Filter & Pump Mfg. Co., 3017 W. Carroll
Salt spray testers
(See advertisement on page 21)

Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.
Electrical measuring & test equipment
(See advertisement on page 20)

Industrial-Scientific Supply Co., 828½ Monroe St., Fort Worth, Texas
Laboratory Supplies

Industrial Timer Corp., 117 Edison Place, Newark 5, N. J.
Industrial Timers, motor driven, with automatic reset. Controllers, signals, testing equipment for electrical parts (operation or life test)

Industrial X-Ray Co., 1613 Second Ave., Seattle, Wash.
X-Ray equipment & X-ray inspection service

Inferno Co., Box 1138, Shreveport, La.
Combustion instruments

Infilco Inc., 325 W. 25th Place, Chicago 16, Ill.
Hydraulic measurement & control & chemical feeding & proportioning.

Instrument Laboratory Inc., P.O. Box 4098 Interbay Station, Seattle 99, Washington
Counting & indicating instruments

Instrument Laboratories, 800 W. North Ave., Chicago 22, Ill.
Testing laboratories

Instrument Resistors, Inc., 25 Amity St., Singac, N. J
Instrument resistors

International Business Machines Corp., 590 Madison Ave., New York, N. Y.
Scales & time instruments

International Equipment Co., 352 Western Ave., Brighton, Boston 25, Mass.
Analytical centifuges

International Register Co., 2620 W. Wash. Blvd., Chicago, Ill.
Coin meters—timers for electric ranges & gas ovens.

International Resistance Co., 401 N. Broad St., Philadelphia, Pa.
Metallized & wirewound fixed & variable resistors including high voltage & high frequency types.

J

Jackson Electrical Instrument Co., 129 Wayne Ave., Dayton 1, Ohio
Radio testing equipment

Jackson, H. Douglas, 851 E. Orange Grove Ave., Pasadena, Calif.
Anemometers

Jacobs Bros. Co. Inc., 1 Main St., Brooklyn, N. Y.
Scales

Jaeger Watch Co., Inc., 304 East 45th St., New York, N. Y.
Automobile clocks, timepieces for aviation and marine, chronometric tachometers & true airspeed indicators

Jansson Gage Co., 19206 Glendale Ave., Detroit 23, Mich.
Gages; gage blocks—special, built up; flush pin and thread gages, carboloy or steel

Jardur Import Co., 21 W. 19th St., New York, N. Y.
Chronographs & stop-watches

Jarrell-Ash Co., 165 Newbury St., Boston, Mass.
Representatives for Adam Hilger, Ltd., manufacturers of optical instruments
(See advertisement on page 91)

J B L Instrument Co., Sycamore & Mill Rd., Clifton Heights, Pa.
Rotary instrument switches, transformer tapping, railway signal gear, decade resistance boxes

J-B-T Instruments, Inc., 443 Chapel St., New Haven 8, Conn.
Electrical measuring & controlling instruments: pyrometers, thermocouples, selector switches, potentiometers, resistance thermometers, laboratory instruments
(See advertisements on pages 38, 73, 93)

Jeffrey Mfg. Co., Columbus, Ohio
Weighting, feeding, batching & proportioning equipment

Jenkins Bros., 80 White St., New York, N. Y.
Regulating valves

Jerguson Gage & Valve Co., 87 Felisway, Somerville 45, Mass.
Precision gages & valves
(See advertisement on page 114)

Jewett Refrigerator Co., 226 Letchworth St., Buffalo, N. Y.
High altitude test & calibration chambers

Johnson Service Co., 507 E. Michigan St., Milwaukee 2, Wisc.
Automatic temperature & humidity control for heating, cooling, ventilating, air conditioning & industrial processes

Johnson-Williams, Ltd., Box 8, Palo Alto, Calif.
Combustible gas indicators & alarm systems, portable & continuous, including accessories

Johnston & Jennings Company, 877 Addison Rd., Cleveland 14, Ohio
Depth gages, valves

Johnston Manufacturing Co., 2823 E. Hennepin Ave., Minneapolis, Minn.
Furnace controls

Jones, Howard B., Div., Cinch Mfg. Co., 2460 W. George S., Chicago 18, Ill.
Connectors

Jones & Lamson Machine Co., Clinton & Whitmore Sts., Springfield, Vt.
Optical comparators

Jones-Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Tachometers, speed indicators & speedometers

Jorgan Co., 65 Atlantic Ave., Rochester, N. Y.

Judson Governor Co., 38 Browns Race, Rochester, N. Y.
Governors

K

Kansas City Laboratory Supply Co., 1434 Wyandotte St., Kansas City, Mo.
Laboratory supplies

Karp Metal Products Co., Inc., 129 - 30th St., Brooklyn, N. Y.
Instrument panels

Kauffman-Lattimer Co., 263 N. Front St., Columbus 16, Ohio
Laboratory Supplies

Keller Mfg. Co., G. P., 2803 Colorado Ave., Santa Monica, Calif.
Balances & weights of precision

Kelley-Koett Mfg. Co. Inc., Covington, Ky.
X-Ray apparatus

Kellogg Switchboard & Supply Co., Clearing Station, 6650 S. Cicero, Chicago 38, Ill.
Relays

Kendall, James W., 13 Miantonomi Ave., Newport, R. I.
Photoelectric cells

Kenyon Instrument Co., Inc., 1345 New York Ave., Huntington, L. I., N. Y.
Airport & marine instruments

Kern Co., 136 Liberty St., New York, N. Y.
Surveying & astronomical instruments

Kessler Co., Walter H., 128 Water St., New York, N. Y.
Thermometers and hydrometers

Kester Solder Co., 4216 Wrightwood Ave., Chicago, Ill.
Cored solders

Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J.
Surveying instruments

Kewaunee Mfg. Co., End of So. Center St., Adrian, Mich.
Laboratory furniture

Kieley & Mueller Inc., 2013-2033—43 St., North Bergen, N. J.
Pressure regulating & flow control devices
(See advertisement on page 6)

Kimball Co., W. W., 420 Kimball Bldg., Chicago, Ill.
Laboratory furniture

Kimble Glass Co., Vineland, N. J.
Glass apparatus, glass tubing, thermometers, hydrometers

King, Andrew, 521 Broad Acres Road, Narberth, Pa.
Portable Brinell Hardness Tester

King Engineering Corporation, 942 Gordon Ave., Ann Arbor, Mich.
Liquid level indicators, distant reading
(See advertisement on page 45)

Kirk & Blum Manufacturing Co., 2838 Spring Grove Ave., Cincinnati, O.
Instrument panels and sheet metal assemblies

Klett Mfg. Co., 179 E. 87th St., New York, N. Y.
Colorimeters

Klingerit, Inc., 16 Hudson St., New York 13, N. Y.
Liquid level gages

Klipfel Mfg. Co., 2641 W. Harrison St., Chicago 12, Ill.
Regulating valves

Knickerbocker Development Corp., 116 Little St., Belleville, N. J.
Automatic testing apparatus, electrical instruments, stroboscopes

Knights Company, James, Sandwich, Ill.
Crystals

Knopf, Paul, 43 Ave. & 37 St., Long Island City, N. Y.
Registering instruments for vehicles

Knowles Scale Works, Lowell, Mass.
Platform, counter & beam scales

Koch & Co., F. A., 72 Spring St., New York, N. Y.
Laboratory supplies

Kolesch & Co., 138 Fulton St., New York, N. Y.
Surveying instruments

Kollmorgen Optical Co., 767 Wythe Ave., Brooklyn, N. Y.
Astronomical & optical instruments

Kollsman Instrument Div., Square D Co., 8008—45th Ave., Elmhurst, Long Island, N. Y.
Precision instruments for aircraft

Krouse Testing Machine Co., 573 E. 11th Ave., Columbus 3, Ohio
Fatigue testing machines

Kuner Co., Max, 804 First Ave., Seattle, Wash.
Nautical instruments

Kurman Electronics Corp., 3518-37 St., Long Island City 1, New York
Relays, electrical test equipment, hearing devices
(See advertisement on page 58)

L

L. A. B. Corp., P. O. Box 162, Summit, N. J.
Special instruments

Laboratory Construction Co., 1113-15 Holmes St., Kansas City 6, Mo.
Laboratory furniture & apparatus

Laboratory Equipment Corp., 720 E. Main St., Benton Harbor, Mich.
Carbon & sulphur determinators

Laboratory Furniture Co., Inc., 37-18 Northern Blvd., Long Island City 1, N. Y.
Laboratory furniture

Laboratory Materials Co., 7319 Vincennes Ave., Chicago, Ill.
Laboratory supplies

Laboratory Specialties, Inc., 144 S. Wabash St., Wabash, Ind.
Mirrors—front surfaces & aluminized; Monochromatic light sources, Black light apparatus, Diffraction gratings, Spectroscopes, Fluorescent & phosphorescent materials

Lambert Meter Co., Inc., Plainfield, N. J.
Gas meters

Lammert & Mann Co., 260 N. Woods St., Chicago, Ill.
Flow regulators & valves

LaMotte Chemical Products Co., McCormick Bldg., Baltimore, Md.
Hydrogen ion apparatus

Lampkin Laboratories, Bradenton, Fla.
Radio-frequency meters

Landis & Gyr, Inc., 104 Fifth Ave., New York, N. Y.
Electric integrating meters; indicating & graphic demand meters for KW, KVA, reactive; prepayment meters; totalizing & remote; time switches; motor wound escapement or synchronous motor types with astronomic dials; miniature ball bearings

Lane Wells Co., 5610 So. Soto St., Los Angeles, Calif.
Oil well testing instruments

Lantz-Phelps Corp., 420 Linden Ave., Dayton, Ohio
Automotive test instruments

La Pine & Co., Arthur S., 114 W. Hubbard St., Chicago, Ill.
Laboratory supplies

Larrimore Sales Co., P.O. Box 1234, St. Louis 1, Mo.
Magnifiers

Lavoie Laboratories, Morganville, N. J.
Ultra high frequency precision frequency meter

Lawrence & Hill, Inc., 142 Main Ave., Watertown, N. Y.
Gages & gaging fixtures

Leach Relay Co., 5915 Avalon Blvd., Los Angeles 3, Calif.
Relays

Lear Avia, Inc., Piqua, Ohio
Aircraft controls, aircraft communication equipment, transmitters, receivers, & direction finders

Lectrohm, Inc., 5147 W. 25th St., Cicero 50, Ill.
Resistors
(See advertisement on page 86)

Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
Electrical measuring instruments for both laboratory & plant. For laboratory: bridges, galvanometers, potentiometers, photometric equipment, test sets & standards. For plant: indicators, recorders & controllers for chemical concentration, CO_2, current, electrolytic conductivity, frequency, gas analysis, humidity, Kw, Rkva, light, electrical load, pH, pressure, pyrometry, radiation, smoke density, speed, temperature, voltage. Speedomax Recorders, Centrimax Flowmeters & Metermax Combustion control Systems
(See advertisements on pages 18, 26, 50, 66, 76, 91, and Front Cover)

Leich Electric Co., 565 W. Washington St., Chicago 6, Ill
Electric motors & switches

Leitz, Inc., E., 304 Hudson St., New York 13, N. Y.
Optical instruments

Lektra Labs., Inc., 30 E. 10 St., New York 3, N. Y.
Timing devices

Lenox Instrument Co., 2010 Chancellor St., Philadelphia 3, Pa.
Optical and technical instruments

Leslie Co., Lyndhurst, N. J.
Pressure reducing valves, pump governors, temperature regulators

Leupold & Stevens Instruments, 4445 N. E. Gilson St., Portland, Ore.
Recorders & indicators, for irrigation, power, waterworks, sewerage. Equipment for hydraulic laboratories. Snow-rain recorders, hydrographic accessories, transits, levels

Levin & Son, Louis, 782 E. Pico Blvd., Los Angeles, Calif.
Instrument lathes

Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.
Portable pyrometers, potentiometers, resistance thermometers & other electrical temperature measuring devices
(See advertisement on Back Cover)

THE FIRST LINE OPERATED DIRECT READING CONTINUOUS INDICATING pH METER

MACBETH pH METER

No batteries whatsoever. Can be left on continuously. Only one operating control. Large, easily read scale. Range—from 0 to 14 pH. Untrained users can make ordinary pH measurements.

Write for Bulletins

MACBETH CORPORATION

227 West 17th Street New York 11, N. Y.

Lewyt Metal Products, 60 Broadway, Brooklyn 11, N. Y.
Instrument housings

Lincoln Park Industries, Inc., Lincoln Park, Mich.
Precision inspection equipment

Lindberg Engineering Co., 2450 W. Hubbard St., Chicago, Ill.
Laboratory furnaces

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Gas gages, gas flowmeters, oxygen regulators

Link Aviation Devices, Inc., Binghamton, N. Y.
Aircraft navigational instruments

Link Engineering Co., 13845 Elmira St., Detroit 27, Mich.
Spring testers

Liquidometer Corp., 36-16 Skillman Ave., Long Island City 1, N. Y.
Liquid level gages
(See advertisement on page 45)

Liquid Scale-Gauge Co., 100 N. First St., Minneapolis 1, Minn.
Liquid level indicating gages

Littelfuse, Inc., 4757 N. Ravenswood Ave., Chicago 40, Ill.
Low amperage precision fuses & fuse mountings

Lord Mfg. Co., 1635 W. 12 St., Erie, Pa.
Bonded rubber vibration isolation mountings & flexible couplings for practical horsepower motors

L & R Manufacturing Co., 577 Elm St., Arlington, N. J.
Instrument cleaning machines & cleaning & rinsing solutions. Crystal cement

Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Timers

Lufkin Rule Co., Saginaw, Mich.
Precision tools & measuring tapes

Lumenite Electric Co., 37 West Van Buren St., Chicago, Ill.
Photoelectric controls

Lundquist Tool & Mfg. Co., 57 Jackson St., Worcester, Mass.
Ammeters

Lustrolite Cleveland Corporation, 6927 Carnegie Ave., Cleveland, Ohio
Fluorescent and phosphorescent paint applied

Lux Clock Mfg. Co., 95 Johnson St., Waterbury 91, Conn.
Automatic timers & clock mechanisms

M

Macbeth Daylighting Corp., 227 West 17th St., New York, N. Y.
Daylight Lamps for titration & color matching
(See advertisements on pages 51, 129)

Machlett & Son, E., 220 East 23rd St., New York, N. Y.
Laboratory apparatus & supplies

MacLead & Hanopol, Chelsea & Joiner St., Charlestown, Mass.
Radio testing instruments

Madison Electrical Products Corp., Madison, N. J.
Chokes, resistances, radio set analyzers, vacuum tube voltmeters
(See advertisement on page 86)

Magnaflux Corp., 5900 Northwest Highway, Chicago 13, Ill
Magnetic inspection equipment

Magnatrol Valve Corp., 52 Beekman St., New York, N. Y.
Valves

Magnatrols, Inc., 2110 S. Marshall Blvd., Chicago 23, Ill.
Flow and level controls

Magnavox Co., Inc., 2131 Bueter Rd., Fort Wayne 2, Indiana
Electrolytic capacitors

Magnetic Analysis Corp., 42-44 12th St., Long Island City 1, N. Y.
Magnetic inspectors for uniform cross-sectional steel

Magnetic Gauge Co., 60 E. Bartges St., Akron, Ohio
Continuous gages, sheet & strip

Magnetostriction Devices Co., 739 Boylston Ave., Boston, Mass.
Magnetostriction galvanometers

Mahady Co., E. P., 857 Boylston St., Boston, Mass.
Laboratory apparatus

Mallory & Co., Inc., P. R. 3029 E. Washington St., Indianapolis 6, Ind.
Capacitors, relays & switches

Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn.
Thermometers, glass, dial & recording; controllographs; indicating & recording controllers; diaphragm motor valves; tachometers, barometers; & hygrometers
(See advertisements on pages 30, 106, 107)

Mansfield & Green, 4601 Euclid Ave., Cleveland 3, Ohio
Gages and dead weight testers
(See advertisement on page 16)

Marine Compass Co., Pembroke, Mass.
Marine instruments

Marion Electrical Instrument Co., Manchester, N. H.
Electrical indicating instruments

Maris Co., John M., 528 Arch St., Philadelphia, Pa.
Laboratory apparatus

Marsh Corp., Jas. P., 2063 Southport Ave., Chicago 14, Ill.
Indicating gages, recording gages, dial thermometers, recording thermometers, refrigeration service instruments, temperature controlling systems, valves for heating systems
(See advertisements on pages 45, 106)

Marshall Co., C. & E., 1445 West Jackson Blvd., Chicago 80, Ill.
Manufacturers & distributors of jewelers, watchmakers & engravers supplies

Marshalltown Mfg. Co., Marshalltown, Iowa
Pressure gages & indicating thermometers

Marston Co., C. A., 506 Washington St., Braintree, Mass.
Time study instruments

Martindale Electric Co., Box 2669, Lakewood Branch, Cleveland, Ohio
Insulation testers

Martin-Decker Corp., 3431 Cherry Ave., Long Beach, Calif.
Torque gages & pull rod dynamometers

Mason-Neilan Regulator Co., 1190 Adams St., Boston, Mass.
Industrial control equipment for pressure temperature, flow, liquid level, combustion & ratio: diaphragm control valves; pressure & vacuum regulators; level controllers; pump speed governors; pump pressure regulators; pipe strainers

Massa Laboratories, Inc., 3868 Carnegie Ave., Cleveland 15, Ohio
Acoustic instruments, sound pressure measurement standards

Master Gauge Co., 2222 Fenkell, Detroit 21, Mich.
Gages & gaging fixtures

Maveg Machine Sales Association, 299 Broadway, New York 7, N. Y.
Dilatometers, dual comparators

Maymer Corp., 10884 Berea Rd., Cleveland 2, Ohio
Scales, dials & templates

M B Mfg. Co., Inc., Instrument Div., 331 East St., New Haven 11, Conn.
Electrical instruments
(See advertisements on pages 15, 116)

McAlear Mfg. Co., 1901 S. Western Ave., Chicago, Ill.
Manual & automatic controls for air, oil gas, steam, chemicals, pure food, acid & alkali

McCord Radiator & Mfg. Co., 2585 E. Grand Ave., Detroit, Mich.
Liquid meters for low flows

McDonnell & Miller, Room 1316, Wrigley Bldg., Chicago 11, Ill.
Boiler controls

McDonnell Odometer Co., 3501 So. Kedzie Ave., Chicago, Ill.
Counters

McFarlin Co., 29 West Marion Ave., Youngstown, Ohio
Leak detectors

McKesson-Doster-Northington Co., 1706 First Ave., Birmingham, Ala.
Laboratory supplies

McNab of Bridgeport, Inc., Bridgeport, Conn.
Marine appliances, torsionmeters, salinity indicators, revolution counters

McNeill Engineering Equipment Co., T. W., 4057 West Van Buren St., Chicago, Ill.
Smoke alarms

Measurements Corp., Boonton, N. J.
Radio Frequency Testing & Measuring Devices
(See advertisements on pages 49, 60, 90, 118)

Meletron Corp., 950 N. Highland Ave., Los Angeles 38, Calif.
Pressure operated switches

Mellaphone Corp., 714 University Ave., Rochester 2, N. Y.
Rectifiers

Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Automatic controls for heating, refrigeration, air conditioning, & various industrial applications
(See advertisement on page 92)

Merco Nordstrom Valve Co., 400 Lexington Ave., Pittsburgh, Pa.
Control valves & valve position indicators

Mercon Regulator Co., 2357 N. 29th St., Milwaukee 10, Wisc.
Power plant specialties in regulation of pressure, level, rate of flow, proportioning & temperature

Meriam Instrument Co., 10920 Madison Ave., Cleveland 2, Ohio
Manometers, draft gages, indicating flow meters for steam, oil, gas, air, water, tank liquid level gages
(See advertisements on pages 35, 41, 54)

Meridian Instrument Co., 303 Fourth Ave., New York 10, N. Y.
Chronometers

Merit Coil & Transformer Corp., 4427 No. Clark, Chicago 40, Ill.
Transformers, coils & reactors, electrical windings

Merz Engineering Co., 200 S. Harding St., Indianapolis 7, Ind.
Gages & gaging fixtures

Merkle Korff Gear Co., 214 North Morgan St., Chicago, Ill.
Motorized speed reducers: induction, synchronous, reversing, d-c., universal motors

Merrick Scale Mfg. Co., Autumn St., Passaic, N. J.
Automatic continuous weighing machines

Merritt Engg. & Sales Co., Inc., 120 So. Niagara St., Lockport, N. Y.
Consistency controls

Meter Devices Co., 1001 Prospect Ave., S. W., Canton 6, Ohio
Electrical test devices

Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.
High frequency amplifiers, electric instruments, oscillators, radio remote control systems, comparator gages, electric tachometers, timers, chronographs

Metzger & Son, F. F., 2600 N. 6 St., Philadelphia, Pa.
Extensometers

Meyer Scientific Supply Co., Inc., 76 Willoughby St., Brooklyn 1, N. Y.
Laboratory apparatus

Meyer Governor Co., 284 Baker Bldg., Minneapolis, Minn.
Long-distance recording, indicating, and contact-making instruments; gage pulsation protectors

Meylan Stopwatch Corp., 264 West 40th St., New York 18, N. Y.
Stop watches

M-G Gage Co., 107 Franklin St., Syracuse, N. Y.
Snap gages

Mico Instrument Co., 10 Arrow St., Cambridge, Mass.
Precision devices in industrial & scientific fields

Microchemical Service, 30 Van Zandt Ave., Douglaston, N. Y.
Microchemical laboratory apparatus

Micro Master Co., 2733 N. Pulaski St., Chicago 39, Ill.
Dial indicators & taper gages

Microstat Corp., P. O. Box 126, Norwalk, Conn.
Photographic equipment for use in microfilming industry

Micro Switch Corp., Spring St., Freeport, Illinois
Snap action switches

Midwest Aircraft Products, Inc., 915 Valley Street, Dayton 4, O.
Solenoid valves

Mid-West Dynamometer & Engg. Co., Western Ave., at 60 St., Chicago, Ill.
Dynamometers

Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Radio test instruments

Miller Corp., Wm., 362 W. Colorado St., Pasadena, Calif.
Machine shop gages

Miller Transformer Co., B. F., P. O. Box 568, Trenton 4, N. J.
Transformers

Millers Falls Co., Greenfield, Mass.
Machine shop gages

Million Radio & Television, 685 West Ohio St., Chicago, Ill.
Radio & allied testing instruments

Milwaukee Gas Specialty Co., 2025 W. Clybourn, Milwaukee, Wis.
Valves, fittings & safety shut-offs for gas fired equipment

Minerallac Electric Co., 25 N. Peoria St., Chicago, Ill.
Potential detectors

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Instruments for the detection, analysis & recording of toxic and combustible gases; instruments for sampling, counting & measuring dust particles

Mine & Smelter Supply Co., 1422-17th St., Denver, Colo.
Industrial equipment & supplies

Miniature Precision Bearings, Keene, N. H.
Miniature ball bearings

Minneapolis Elec. & Construction Co., 80 South 12th St., Minneapolis, Minn.
Wire length measuring machines

Minneapolis-Honeywell Reg. Co., 2727 - 4 Ave., S. Minneapolis, Minn.
Heating, ventilating and air conditioning control equipment; thermostats; safety controls; motor and diaphragm operated valves; relays; furnace controllers

Mobile Refrigeration, Inc., 630 Fifth Ave., New York, N. Y.
High altitude test & calibration chambers

Modern Kiln & Furnace Co., American & York Streets, Philadelphia 33, Pa.
Ovens, furnaces & controllers

Moeller Instrument Co., 132nd St. & 89th Ave., Richmond Hill, N. Y.
Thermometers, hydrometers, etc.
(See advertisement on page 61)

Mogey & Sons, Inc., William, Interhaven Ave., Plainfield, N. J.
Optical testing instruments and optical parts

Moist-O-Meter, Inc., Board of Trade Bldg., Kansas City, Mo.
Moisture testers

Moisture Register Co., 133 N. Garfield Ave., Alhambra, Cal.
Moisture testing instruments & devices
(See advertisement on page 101)

Moline Furniture Works, Moline, Ill.
Laboratory furniture

Monarch Manufacturing Co., 20 N. Major Ave., Chicago 39, Ill
Radio set testers

Monarch Manufacturing Works, Inc., Salmon & Westmoreland Sts., Philadelphia, Pa.
Strainers, oil burner nozzles & regulating valves, viscosimeters

Monitor Controller Co., Gay, Lombard & Frederick Sts., Baltimore, Md.
Electrical controllers

Moore Products Co., 901 E. Lycoming St., Philadelphia 24, Pa.
Industrial instruments
(See advertisement on page 29)

Morehouse Machine Co., York, Penna.
Proving rings

Morey and Jones, Ltd., 922 So. Hemlock St., Los Angeles, Calif.
Recording & indicating flow meters

Morse Twist Drill & Machine Co., New Bedford, Mass.
Gear testers

Mosher Electronic Control Systems, 130 W. 42 St., New York 18, N. Y.
Electronic bin level indicators & electronic load regulators for pulverizing machinery

Mossman, Inc., Donald P., 6713 N. Olmsted, Chicago 31, Ill.
Switches

Mott-Smith Corp., 1505 Shell Bldg., Houston, Texas
Geophysical instruments

Munsell Color Co., Inc., 10 E. Franklin St., Baltimore, Md.
Color comparators

Mu-Switch Corp., 38 Pequit St., Canton, Mass.
Snap action switches

Muter Company, 1255 S. Michigan Ave., Chicago 5, Ill.
Radio & electrical products

- Cuts Fast-Clean-Accurate
- Cuts a perfect inside square
- Double end for double duty work
- Removable blade
- Sure grip, aluminum handle
- Cuts hard metal with ease
- Length 5 inches

CARBOLOY
The hardest of all metals. Precision CARBOLOY the new quick clean cutting graver. At last the Long Sought Perfect Graver is Here.

Price $5.00
Extra blades 2.00 each

HENRY PAULSON & CO.
37 S. WABASH AVE. CHICAGO 3, ILL.

N

Nashville Surgical Supply Co., 401 Church St., Nashville, Tenn.

Nason Co., 7663 Epworth Blvd., Detroit 4, Mich.
Controllers & testing devices

Nathan Mfg. Co., 250 Park Ave., New York, N. Y.
Valves

National Airoil Burner Co., 1284 E. Sedgley Ave., Philadelphia, Pa.
Liquid level controllers

National Aluminate Corp., 6216 West 66th St., Chicago, Ill.
Conductivity meters

National Brass Co., 1600 Madison St., S. E., Grand Rapids, Mich.
Combustion & draft controllers

National Carbon Co., Inc., Carbon Products Div., P. O. Box 6087, Cleveland 1, Ohio
Accelerated weathering testers

National Electric Controller Co., 5305 Ravenswood Ave., Chicago 40, Ill.
Rheostats

National Engineering Products, Inc., Commerce & Savings Bldg., Washington, D. C.
Pressure gage equalizers

National Instrument Co., 246 Walnut St., Newtonville 60, Mass.
Electro-mechanical instruments & devices

National Meter Co., 4207 First Ave., Brooklyn, N. Y.
Water, oil & gasoline meters

National Research Corp., 100 Brookline Ave., Boston, Mass.
Optical products, high vacuum apparatus

National Scientific Corp., 2141 W. North Ave., Chicago, Ill.
Laboratory supply house

National Technical Labs., 820 Mission St., Pasadena, Calif.
Beckman pH instruments and electro-metric pH equipment for completely automatic indication, control & recording of pH in large scale industrial processes

National Time & Signal Corp., 600 East Milwaukee Ave., Detroit, Mich.
Timers for welding & industrial process control

Natural Gas Equipment Inc., 541 Petroleum Securities Bldg., Los Angeles, Calif.
Furnace controllers

Naxon Utilities Corp., 2101-2111 West Walnut St., Chicago 12, Ill.
Instrument cleaning machines

Negus, T. S. & J. D., 69 Pearl St., New York, N. Y.
Nautical instruments

Nelson Section Liner Co., 229 W. Garden St., Decatur, Ill.
Drawing instruments

Nelson Vacuum Pump Co., Geo. F., 2918 Fulton St., Berkeley, Calif.
High vacuum pumps

Neptune Meter Co., 50 W. 50th St., New York, N. Y.
Liquid meters

Nester Company, Inc., L. G. Millville, N. J.
Oxygen regulators

Newark Scale Works, 10-12 Hobson St., Newark, N. J.
Scales

Newark Wire Cloth Co., 336 Verona Ave., Newark, N. J.
Sieves

N. J. Laboratory Supply Co., 235 Plane St., Newark, N. J.
Laboratory supplies

New Jersey Meter Co., Plainfield, N. J.
Compressed air meters, separators for removing water & oil from compressed air lines, liquid flow indicators with low flow signalling circuit.
(See advertisement on page 37)

N. Y. Laboratory Supply Co., Inc., 530 Broadway, New York, N. Y.
Laboratory supplies

New York Scientific Supply Co., 111 East 22nd St., New York, N. Y.
Laboratory supplies

New York Transformer Co., 62 William St., New York 5, N. Y.
Transformers

Niagara Electrical Instrument Co., 725 Genesee Bldg., Buffalo, N. Y.
Electrical power analyzer

Niehoff & Co., C. E., 4925 Lawrence Ave., Chicago, Ill.
Auto test equipment

Nordstrom Valve Co., Division of Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Valves

Norcross Laboratories, 50 Hunt St., Watertown, Mass.
Humidity controllers and recording viscosimeters

North American Manufacturing Co., 2910 E. 75th St., Cleveland 4, Ohio
Valves and valve operating devices

North American Philips Co., Inc., 100 E. 42nd St., New York 17, N. Y.
X-ray equipment

Northern Engraving & Mfg. Co., La Crosse, Wis.
Aviation instruments, pressure gages

Northern Equipment Company, 1945 Grove Drive, Erie, Pa.
Boiler feed control

Northern Laboratories, Ltd., 3-01 27th Ave., Long Island City, N. Y.
Custom built test chambers involving charges of temperature, pressure and humidity and specialized thermo-dynamic and electronic development.

Norton Co., 1 New Bond St., Worcester 6, Mass.
Refractory laboratory ware, porous plates & tubes

Norton Electrical Instrument Co., 101 Hilliard St., Manchester, Conn.
Electrical instruments

Notheifer Winding Laboratories, 109 Albemarle Ave., Trenton, N. J.
Transformers

Nurnberg Thermometer Co., Inc., 397 Bridge St., Brooklyn, N. Y.
Thermometers & Hydrometers

Nye, Inc., Wm. F., New Bedford, Mass.
Instrument & watch oils

O

Ohio Injector Co., 3 Main St., Wadsworth, Ohio
Check valves

Ohmer Corporation, 740 Bolander Ave., Dayton 1, Ohio
Mileage recorders

Ohmite Mfg. Co., 4826 W. Flournoy St., Chicago 44, Ill.
Close control rheostats, fixed & adjustable power resistors, precision & non-inductive resistors, attenuators, tap switches and R. F. chokes.
(See advertisement on page 89)

Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa.
Testing machines

Omega Machine Co., 3409 E. 18 St., Kansas City, Mo.
Chemical feeding equipment for dry or liquid materials, by volume or by weight

Optical Engineering Labs., 63 Park Row, New York, N. Y.

Optron Laboratory, 2655 Salem Ave., Dayton 6, Ohio
Optical flats, reflectors, prisms
(See advertisement on page 35)

Orton Jr. Ceramic Foundation, Edward, 1445 Summit St., Columbus, Ohio
Seger cones

Oster Mfg. Co., John, Terminal Bldg., 1 Main St., Racine, Wis.
Fractional horsepower motors
(See advertisement on page 58)

TUBING . . .

ACCURATELY DRAWN SEAMLESS

ALUMINUM, COPPER, BRASS and NICKEL TUBING

in unusual sizes from 3/8" O.D. down to 0.010" O.D. with wall thickness up to 0.020".

METAL SHIELDED WIRE . . .

A new method of shielding insulated wires with Seamless

ALUMINUM OR COPPER TUBING

providing protection against electrical interference, moisture and mechanical damage.

Catalog and Samples on request

PRECISION TUBE CO.

3824-26-28 TERRACE STREET, PHILADELPHIA 28, PA.

Branches in all Principal Cities

INDUSTRIAL THERMOMETERS
LABORATORY THERMOMETERS
THERMOSTATS
THERMOREGULATORS
TEMPERATURE CONTROLS
SPECIAL RELAYS
BAROMETERS
ALTITUDE STANDARDS
ABSOLUTE PRESSURE GAUGES
VACUUM GAUGES
AMMONIA GAUGES
DRAFT GAUGES
RAIN AND SNOW GAUGES
MANOMETERS
WATER GAUGES
TANK GAUGES
HYGROMETERS
PSYCHROMETERS
HYDROMETERS
CALENDER MICROMETERS
EXPERIMENTAL AND DEVELOPMENTAL INSTRUMENT MAKING

1437 BRANDYWINE STREET — POSTAL ZONE 30

P

Pacific Biological Labs., Pacific Grove, Calif.
Laboratory supplies

Pacific Scientific Co., Inc., 1430 Grande Vista Ave., Los Angeles 23, Calif.
Cable tension indicator

Pacific Tool & Supply Co., 344 N. Vermont Ave., Los Angeles, Calif.
Inside micrometers, telescope gages

Palmer Co., 2511 Norwood Ave., Cincinnati, Norwood 12, Ohio
Industrial indicating "Red-Reading-mercury" thermometers & dial thermometers
(See advertisement on page 108)

Palo-Myers, Inc., 81 Reade St., New York 7, N. Y.
Laboratory supplies & boiler water testing equipment

Panoramic Radio Corp., 245 W. 55th St., New York, N. Y.
Electronic instruments and inspection devices

Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill.
Timers

Park Sales Co., 421 Canal St., New York, N. Y.
Micrometers and calipers

Parks-Cramer Co., Fitchburg, Mass.
Humidity, heat & air change control, wet bulb temperature regulators

Parr Instrument Co., 222 52nd St., Moline, Ill.
Combustion bombs, calorimeters, hydrogenation apparatus, melting point apparatus

Partlow Corp., 2 Campion Rd., New Hartford, N. Y.
Temperature indicators & controllers, time delay relays

Passaic Analytical Laboratories, Inc., 228 Ayerigg Ave., Passaic, N. J.
Instrument cleaning machines

Pastor Stop Watch Co., 43 East Main St., Waterbury 22, Conn.
Stop watches

Patterson Screen Div., E. I. duPont de Nemours & Co., Towanda, Pa.
X-ray intensifying and fluoroscopic screens

Paulson & Co., Henry, 37 So. Wabash Ave., Chicago, Ill.
Watch checking instruments, horological & instrument tools & supplies
(See advertisement on page 130)

Paulstick & Sons, H., 2124 Fulton St., Brooklyn, N. Y.
Thermometers

Penberthy Injector Co., 1242 Holden St., Detroit 2, Mich.
Liquid level gages

Penn Electric Switch Co., Box 556, Goshen, Ind.
Automatic controls for pressure, temperature, humidity, liquid level; also mechanically actuated unit switches. Specialized controls for refrigeration, air conditioning, heating, pumps, air compressors.

Penn Industrial Instrument Corp., 3116 N. 17th St., Philadelphia 32, Pa.
Flow meters
(See advertisement on page 37)

Penn Optical & Inst. Co., 50 S. San Gabriel Blvd., Pasadena 8, Calif.
Optical parts
(See advertisement on page 53)

Perfex Corp., 500 W. Oklahoma Ave., Milwaukee 7, Wis.
Automatic temperature controls for oil burners, stokers, gas burners, refrigeration & air conditioning

Perkin-Elmer Corp., 535 Hope St., Glenbrook, Conn.
Optical instruments

Perkins & Son, Inc., B. F., Holyoke, Mass.
Testers for leather, paper & textiles

Permo Incorporated, 450 E. Ohio St., Chicago, Ill.
Instrument pivots & contacts
(See advertisement on page 67)

Permutit Company, 330 West 42nd St., New York, N. Y.
Indicators & recorders for CO_2, specific gravity of natural, manufactured or process gases, exhaust gas analysis, other uses where gas density guides operation

Petrometer Corp., 1 Star Square, Long Island City 1, N. Y.
Distant reading, liquid level tank gages

Pfaltz & Bauer, Inc., 350 5th Ave., New York 1, N. Y.
Laboratory control instruments

Philadelphia Thermometer Co., 915 Filbert St., Philadelphia, Pa.
Instruments for temperature indication, control & regulation
(See advertisement on page 107)

Phillips Manufacturing Co., 3475 W. Touhy Ave., Chicago, Ill.
Vapor degreasers & instrument cleaning machines

Phipps and Bird, Inc., Richmond, Va.
Laboratory apparatus & chemicals

Phoenix Precision Instrument Co., 622 Penfield Bldg., 1328 Chestnut St., Philadelphia 7, Pa.
Laboratory equipment
(See advertisement on page 49)

Photobell Corp., 116 Nassau St., New York, N. Y.
Photoelectric equipment

Photoswitch, Inc., 21 Chestnut St., Cambridge, Mass.
Industrial photoelectric controls including counting equipment, electronic timers & special electronic controls, smoke controls

Photovolt Corp., 95 Madison Ave., New York, N. Y.
Photo-electric elements, photometers, electronic timing devices, photo-electric colorimeters, photo-electric exposure meters, densitometers

Physicists Research Co., 321 S. Main St., Ann Arbor, Mich.
Specialists in solution of unusual industrial research jobs, with special experience in machinery noise reduction, development of special instruments, & measurement of surface irregularities

Pickering Governor Co., Portland, Conn.
Governors

Pierce Watch Company, 22 West 48th St., New York, N. Y.
Stop watches

Pike & Co., E. W., Elizabeth, N. J.
Illuminated magnifiers & microscopes

Pitometer Log Corp., 206 Lafayette St., New York 12, N. Y.
Pitot tube flowmeters

Pittsburgh Equitable Meter Division, Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Gas & liquid meters, gas pressure regulators & accessories

Pittsburgh Instrument & Machine Co., 1026 Reedsdale St., Pittsburgh 12, Pa.
Brinell Machines, alternating impact machines, surveying instruments
(See advertisement on page 97)

Pittsburgh Taximeter Co., Point Bldg., Pittsburgh, Pa.
Vehicle recorders

Plumb Co., Inc., D. S., 73-77 Norfolk St., Newark 4, N. J.
Pressure gage movements
(See advertisement on page 43)

Plummer & Kershaw, 2757 Frankford Ave., Philadelphia 34, Pa.
Optical parts
(See advertisement on page 62)

Pneumatic Scale Corp. Ltd., Norfolk Downs Station, Quincy, Mass.
Packaging scales

Pneumercator Co., Inc., 305 E. 46th St., New York, N. Y.
Level indicators

Pointloid Inc., 93 Mercer St., New York, N. Y.
Fabricators of plastics, sheets, rods & tubes

Polarad Electronics Co., 135 Liberty St., New York 6, N. Y.
Amplifiers, audiofrequency equipment, oscillators, remote control equipment

Polarized Light-Photoelastic Co., 557 W. 124 St., New York 27, N. Y.
Photoelastic polariscopes

Polarized Products Corp., 113 University Place, Whitestone, L. I., N. Y.
Polarization plates

Polarizing Instrument Co., 630 Fifth Ave., New York, N. Y.
Photoelasticity apparatus

Poole Manufacturing Engineers, 1705 N. Field St., Dallas 1, Texas
Tube inside micrometer for big gun internal measurements and refinery still tubes

Porter, George K., Hatboro, Pa.
Scales
(See advertisement on page 120)

Positel Manufacturing Co., 4 Indian Rock Path., Berkeley 7, Cal.
Remote indicating liquid level gages.

Post Company, Frederick, P. O. Box 803, Chicago, Ill.
Instruments & equipment for architect & engineer

Potter & Brumfield, Princeton, Ind.
Relays

Potter Co., 1950 Sheridan Rd., North Chicago, Ill.
Automotive service instruments

Powers Regulator Co., 2734 Greenview Ave., Chicago, Ill.
Controls for air conditioning, temperature & humidity; also water temperature controls, dial indicating & recording thermometers & steam traps
(See advertisements on pages 27, 80, 104)

Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Machine shop instruments

Precision Apparatus Corp., 92-27 Horace Harding Blvd., Elmhurst, L. I. N. Y.
Radio test instruments

Precision Gage & Tool Co., 320 East 3rd St., Dayton, Ohio
Machine shop gages

Precision Metal Turning Co., 534 West Broadway, New York 12, N. Y.
Metal turning, dials, screw machine parts, metal stampings

Precision Resistor Co., 334 Badger Ave., Newark, N. J.
Resistors

Precision Scientific Co., 1736 N. Springfield Ave., Chicago 47, Ill.
Standard & custom-built laboratory equipment

Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia, Pa.
Scientific instruments
(See advertisement on page 131)

Precision Tube Company, 3824-26-28 Terrace St., Philadelphia, Pa.
Fine tubing & metal shielded wire
(See advertisement on page 131)

Preferred Utilities Mfg. Corp., 31 West 60th St., New York, N. Y.
Boiler plant instruments

Premier Crystal Laboratories, Inc., 63 Park Row, New York, N. Y.
Piezo electric quartz and tourmaline crystals, reactance & capacity meters

Premier Metal Etching, 21-03 44th Ave., Long Island City, N. Y.
Instrument dials & scales; nameplates & panels
(See advertisement on page 32)

Process Controls Co., 2 East End Ave., New York 21, N. Y.
Designers and builders of electrical, mechanical and electronic controls for automatic equipment and processes.
(See advertisement on page 132)

Production Instrument Co., 710 W. Jackson Blvd., Chicago, Ill.
Electric & mechanical counting, timing & recording devices & actuating switches
(See advertisement on page 32)

Proportioneers, Inc., 152 Codding St., Providence 1, R. I.
Automatic controlling & proportioning equipment.

Pyle National Co., 1334 N. Kostner Ave., Chicago 51, Ill.
Connectors

Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y.
Pyrometers for various purposes
(See advertisement on page 73)

Pyrometer Service Co., 228 River Rd., Arlington, N. J.
Pyrometer Tubes, Thermocouples.
(See advertisement on page 27)

R

Racine & Co., Jules, 20 West 47th St., New York, N. Y.
Stop watches

PROCESS CONTROL CO., Inc.

2 East End Avenue
New York 21, N. Y.
Telephone Butterfield 8-7403

●

DESIGNERS AND BUILDERS OF:

Electrical, mechanical and electronic controls for automatic equipment, machines and processes. Product designers, project engineers, and research and development of automatic equipment.

DEVELOPMENT PROJECTS UNDERTAKEN IN FIELDS SUCH AS:

Gaging, sorting, timing, weighing and measurement and control in the process industries.

STAFF CONSISTS OF:

Physicists, chemists, electrical, mechanical and electronic engineers, with established success in design and production of automatic devices.

●

YOUR INQUIRIES SOLICITED

Radio City Products Inc., 127 W. 26th St., New York 7, N. Y.
Electrical & radio testing instruments & accessories

Radio Frequency Laboratories, Inc., Boonton, N. J.
Electronic equipment.

Radio Transceiver Labs., 8627 115th St., Richmond Hill, New York
High frequency radio transmitters & receivers

Rahm Instruments, Inc., 12 W. Broadway, New York 9, N. Y.
Direct reading oscillographs & strip chart recorders.

Ranco, Inc., 601 West Fifth Ave., Columbus 1, Ohio
Refrigeration controls

Randall, Frank E., 248 Ash St., Waltham, Mass.
Machinists' dial gages

Rascher & Betzold, 829-835 Orleans St., Chicago, Ill.
Laboratory supplies

Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.
Amplifiers, audio-frequency equipment, variable capacitors, photoelectric cells, microphones

Rawson Electrical Instrument Co., 112 Potter St., Cambridge, Mass.
Dynamometers, wattmeters, milliammeters & voltmeters. Also ultra-sensitive meters both for A.C. & D.C., fluxmeters, electrostatic voltmeters, Thermocouples in vacuum, earth current meters, cable testers, milli-second timers
(See advertisement on page 119)

Raytheon Mfg. Co., 190 Willow St., Waltham, Mass.
Automatic & manually controlled rectifiers for all communication, industrial or laboratory applications

R. C. A. Manufacturing Co., Inc., Camden, N. J.
Radio & electronic equipment for all purposes including laboratory & industrial apparatus

Read Machinery Co., Inc., York, Penna.
Chemical & Industrial Equipment

Redington Co., F. B., 112 S. Sangamon St., Chicago, Ill.
Counters: production, revolution, stroke

Reed Small Tool Works, 40 Dewey St., Worcester, Mass.
Machine shop micrometers

Refinery Supply Co., 621 East Fourth St., Tulsa, Okla.
Gas testing instruments & specialties for oil & gas industry; & laboratory supplies
(See advertisement on page 16)

Refrigerating Specialties Co., 728 So. Sacramento Blvd., Chicago 12, Ill.
Automatic valves & regulators

Reich Mfg. Co., J. R., 43 East Stroup Road, Dayton, Ohio
Test indicators

Reiner Electronics Co., 152 W. 25th St., New York 1, N. Y.
Electronic testing equipment

Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland, Ohio
Steam specialties

Reliance Instrument Co., 715 N. Kedzie St., Chicago, Ill.
Electrical instruments

Republic Flow Meters Co., 2249 Diversey Parkway, Chicago, Ill.
Remote reading flow meters, complete line of power plant & industrial instruments for the measurement of flow, level, pressure, draft, temperature & Co_2. Automatic boiler controls, regulators, valves and desuperheaters
(See advertisement on page 37)

Resistors, Inc., 2241 Indiana Ave., Chicago 16, Ill.
Resistors, adjustable, variable & wire wound

Reveo, Inc., Deerfield, Mich.
Sub zero test cabinets

Revere Corporation of America, P. O. Box 304, Wallingford, Conn.
Thermocouples for liquids, air, metal, hot gases, Thermocouple wire, harnesses and leads. Pitot tubes (shielded & unshielded). Engine & Flight test recording accessories
(See advertisement on page 103)

Rex Rheostat Co., 3 Foxhurst Rd., Baldwin, L. I., N. Y.
Protected & unprotected slide-contact rheostats & adjustable, wire wound resistors
(See advertisement on page 88)

Reynolds Gas Regulator Co., Anderson, Ind.
Automatic valves & regulators

Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford, Conn.
Time switches

Richards, Arklay S., 52 Winchester St., Newton Highlands, Mass.
Thermocouples, lead wire & protection tubes
(See advertisement on page 103)

Richardson-Allen Corp., 15 W. 20 St., New York, N. Y.
Timers & time switches

Richardson Scale Co., Clifton, N. J.
Automatic weighing machinery

Riehle Testing Machine Division, American Machine & Metals Inc., East Moline, Ill.
Testing machines & testing instruments for tension, compression, bending, torsion, shear, hardness, wear

Rieker Instrument Co., 1919 Fairmount Ave., Philadelphia, Pa.
Scientific instruments

Ring-Balance Instrument Co., 740 N. Franklin St., Chicago 10, Ill.
Flow meters, draft & pressure gages for low pressure gas & air measurements. Recording, indicating & integrating in any combination
(See advertisement on page 36)

Riverbank Laboratories, Geneva, Ill.
Tuning forks

R & M Mfg. Co., Royal Oak, Mich.
Machine shop gages

Robertshaw Thermostat Co., Youngwood, Pa.
Thermostats

Robertson & Co., John H., 1767 W. Armitage Ave., Chicago, Ill.

Robertson, 3rd, J. L., 116 Broad St., New York, N. Y.
Engine indicator accessories

Robinette Co., W. C., 802 Fair Oaks Ave., S. Pasadena, Cal.
Automatic control devices
(See advertisement on page 24)

Robinson Optical Co., 3048 Rodman St., N. W., Washington, D. C.
Optical flats, mirrors, prisms & lenses

Robinson Orifice Fitting Co., 1435 Santa Fe Ave., Los Angeles 21, Calif.
Orifice fittings & plates

Rochester Mfg. Co., Inc., Rockwood St., Brighton, Rochester, N. Y.
Pressure & liquid level indicators & thermometers

Rockwell Co., Stanley P., 296 Homestead Ave., Hartford, Conn.
Dilatometers

Rogear Co., 11 Water St., New York, N. Y.
Paints which change color with temperature.

Roemer Drug Co., 606 N. Broadway, Milwaukee, Wis.
Laboratory supply house

Roller-Smith Co., Bethlehem, Pa.
Instruments (indicating & graphic), air & oil circuit breakers, relays, switchboards, precision balances, transformers, instrument & control switches

Rolnick Testing & Mfg. Co., 316 N. 22 St., Philadelphia, Pa.

Roth Brothers Chronometer Co., 104 E. 23 St., New York, N. Y.
Marine chronometers, sextants, torpedo boat watches

Rowe Radio Research Laboratory Co., 2422 N. Pulaski Road, Chicago 39, Ill.
Specialized industrial & laboratory equipment, Electro-mechanical & electronic devices

R-S Products Corp., Wayne Junction, Philadelphia 44, Pa.
Butterfly valves & heat treating furnaces

Rubicon Co., Ridge Ave. at 35th St., Philadelphia, Pa.
Precision electrical instruments: potentiometers, galvanometers, bridges, resistance standards, for standardization, research, calibration of meters, production testing, & educational applications. Photoelectric colorimeters, transmission dynamometers & other special apparatus
(See advertisement on page 19)

Rudolph & Sons, O. C., P. O. Box 446, Caldwell, N. J.
Optical instruments

Rueckert Manufacturing Co., 83 King St., E. Greenwich, R. I.
Cases for instruments

Ruehfel Co., Inc., George, 93-08 95 Ave., Ozone Park, N. Y.
Laboratory instruments & apparatus

Rupp & Bowman Co., 315 Superior St., Toledo, Ohio
Laboratory supplies

Ruska Instrument Corp., 4607 Montrose Blvd., Houston 6, Texas
Geophysical instruments

Rutteo Mfg. Co., 103-04 Metropolitan Ave., Forest Hills, N. Y.

Ryan Recording Thermometer Co., 654 Mill St., Los Angeles, Calif.
Bimetallic thermostat recording thermometer

Ryan Tool & Engineering Co., 19159 John R St., Detroit, Mich.
Height gages, fixtures, special machinery

S

Sampsel Time Control, Inc., Spring Valley, Ill.
Combustion control equipment

Sanborn Co., 39 Osborne St., Cambridge, Mass.
Electronic instruments

Sangamo Electric Company, Springfield, Ill.
Electric meters of all types; also instrument transformers, time-switches & radio condensers.

Sarco Company, Inc., 183 Madison Ave., New York, N. Y.
Temperature regulators

Sargent & Co., E. H., 155 E. Superior St., Chicago, Ill.
Laboratory supplies & chemicals

Saxl Instrument Co., Inc., 42 Weybosset St., Providence, R. I.
Precision instruments

Schaar & Co., 754 W. Lexington St., Chicago, Ill.
Laboratory supplies

Schade Valve Mfg. Co., 2527 N. Bodine St., Philadelphia 33, Pa.
Automatic valves

Schaefer Bros. Co., 1059 W. 11th St., Chicago, Ill.
Rheostats

Schaffer Poidometer Co., 2828 Smallman St., Pittsburgh, Pa.
Scales

Schauer Machine Co., 2060 Reading Rd., Cincinnati 2, Ohio
Battery chargers, rectifiers & photoelectric cells

Scherr Co., Inc., George, 200 Lafayette St., New York 12, N. Y.
Optical measuring and inspection equipment
(See advertisements on pages 23, 42, 49, 55)

Schutte & Koerting Co., 12th & Thompson Sts., Philadelphia, Pa.
Rotameters

Schwein Engg. Co., L. N., 5736 Washington Blvd., Los Angeles, Calif.
Aircraft instruments & pressure control instruments
(See advertisement on page 12)

Schweitzer & Conrad, Inc., 4435 Ravenswood Ave., Chicago, Ill.
High voltage testers, voltage detectors, & temperature indicators

Scientific Apparatus Co., 4 Landscape Ave., Yonkers, N. Y.
Laboratory apparatus

Scientific Glass Apparatus Co., Inc., 49 W. Ackerman St., Bloomfield, N. J.
Glass apparatus & interchangeable ground glass joints

Scientific Instrument Co., 1441 Walnut St., Berkeley Calif.
Current meters

Scientific Instrument Co., 535 W. Larned St., Detroit, Mich.
Industrial & laboratory thermometers; hydrometers; special laboratory apparatus

Scientific Supplies Co., 123 Jackson St., Seattle 4, Wash.
Laboratory supplies

Scott Co., Henry L., Blackstone & Culver Sts., Providence, R. I.
Physical testing machines

Seedburo Equipment Co., 644 Brooks Bldg., Chicago 6, Ill.
Moisture testers, ovens, scales, thermometers

Seederer-Kohlbusch, Inc., 149-151 New York Ave., Jersey City, N. J.
Analytical balances & weights

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SUN RADIO
& ELECTRONICS CO., Inc.
122 124 DUANE ST NEW YORK 7, N Y Barclay 7 1840

Seely Instrument Co., Inc., 377 4th St., Niagara Falls, N. Y.
Controllers & valves

Seena Manufacturing Co., Inc., 153 W. 72nd St., New York 23, N. Y.
Heater plugs, cord sets, cube block contacts

Selas Co., Erie Ave. & D St., Philadelphia 34, Pa.
Indicating flow meters

Selsi Co., Inc., 43 W. 23rd St., New York, N. Y.
Optical goods, scientific instruments

Sensitive Research Instrument Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.
Electrical instruments measuring quantities or values of small current or voltage

Service Recorder Co., 1375 Euclid Ave., Cleveland, Ohio
Vehicle recorders

Shallcross Controls, Inc., 121 N. Broadway, Milwaukee, Wisc.
Furnace controls

Shallcross Manufacturing Co., 10 Jackson Ave., Collingdale, Penna.
Rotary Selector Switches with solid silver contacts, accurate instrument resistors 0.1% — 5%, decade resistances & standards, bridges, telephone transmission test sets, resistance thermometers, bonding testers & special instruments for electrical measurements

Shawmut Engg. Co., 179 Freeport St., Boston, Mass.
Abrasion testers

Sheffield Corp., 15 E. 3 St., Dayton, Ohio
Machine shop gages

Sheldon & Co., E. H., Muskegon, Mich.
Laboratory furniture

Sheldon Electric Corp., 100 Fifth Ave., New York, N. Y.
Photoelectric color matching machines

Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Electronic testing equipment

Shore Instrument & Mfg. Co., Van Wyck & Carll St., Jamaica, N. Y.
Scleroscope hardness testers
(See advertisement on page 97)

Shure Bros., Inc., 225 W. Huron St., Chicago 10, Ill.
Crystal, carbon & dynamic microphones, sound level microphones, vibration pick-ups

Shurite Meters, 61 Hamilton St., New Haven 8, Conn.
Electrical panel & portable instruments

Sickles Co., F. W., Springfield, Mass.
Electrical products

Sigma Instruments Inc., 70 Ceylon St., Boston, Mass.
Relays
(See advertisement on page 83)

Signal Indicator Co., 894 Broadway, New York 3, N. Y.
Dial lights

Simmonds Aerocessories, Inc., 21-10 49th Ave., Long Island City, N. Y.
Specialized aeronautical and engineering accessories

Simplex Time Recorder Co., Sanborn St., Gardner, Mass.
Time recording clocks

Simplex Valve & Meter Co., 6787 Upland St., Philadelphia 42, Pa.
Flow controls, meters, gages proportioning & ratio control equipment

Simpson Electric Co., 5216 Kinzie St., Austin Station, Chicago 44, Ill.
Electrical instruments

Simpson Optical Mfg., 3200 W. Carroll Ave., Chicago 24, Ill.
Lenses, prisms, optical flats & complete optical systems
(See advertisement on page 63)

Size Control Company, 35 E. Wacker Drive, Chicago 1, Ill.
Machine shop & special gages, measuring wires
(See advertisement on page 44)

Sjostrom Co., John E., 1711 N. Tenth St., Philadelphia, Pa.
Laboratory furniture

Skyway Precision Tool Co., 3217 Casitas Ave., Los Angeles 26, Calif.
Torque wrenches, torque meters, spring testers, torque screw drivers
(See advertisement on page 102)

Slocomb Co., J. T., 35 Oxford St., Providence 5, R. I.
Micrometer calipers

Small Motors, Inc., 2068 Elston Ave., Chicago 14, Ill.
Universal fractional horsepower motors, dynamotors, shaded pole motors & generators

Smith Co., Maxwell, 2254 Sepulveda Blvd., Los Angeles, Calif.
Drift indicators, fire control instruments, lenses, nautical instruments

Snap-on Tools Corp., 8044 28 Ave., Kenosha, Wis.
Torquemeters

Sodemann Heat & Power Co., 2300 Delmar Blvd., St. Louis, Mo.
Air conditioned moist cabinet

Sola Electric Co., 2525 Clybourn Ave., Chicago 14, Ill.
Transformers, automatic voltage adjusters

Soltmann Inc., E. G., 250 East 43rd St., New York, N. Y.
Drawing & engineering materials

Sorensen & Co., Inc., 375 Fairfield Ave., Stamford, Conn.
Chokes, current regulators, voltage regulators, transformers
(See advertisement on page 117)

Sorvall, Ivan, 210 5th Ave., New York 10, N. Y.
Variable transformers
(See advertisement on page 111)

Sound Apparatus Co., 150 West 46th St., New York, N. Y.
Sound measuring equipment

South Bend Lathe Works, 303 E. Madison St., South Bend, Ind.
Precision lathes

Southern Desk Co., Hickory, N. C.
Laboratory furniture

Sparling, R. W., 945 N. Main St., Los Angeles 12, Calif.
Liquid meters

Specialty Glass Co., 536 Lake Shore Drive, Chicago 11, Ill.
Laboratory glassware

Speedometer Electric Co., 699 Van Ness Ave., San Francisco, Calif.
Survey footmeter

Speedway Mfg. Co., 1834 S. 52 St., Cicero, Ill.
Skeleton & encased a.c., d.c. & universal motors (1/3000 to 1/3 h.p.) low voltage solenoids

Speidel & Co., Chas. W., 112 N. 12th St., Philadelphia, Pa.
Surveying instruments

Spence Engineering Co., Inc., 53 Grant St., Walden, N. Y.
Regulating valves

Sperry Gyroscope Co., Inc., Manhattan Bridge Plaza, Brooklyn 1, N. Y.
Aircraft & marine navigational instruments

Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J.
Special railway testers

Sperry-Sun Well Surveying Co., 1608 Walnut St., Philadelphia 3, Pa.
Underground surveying instruments for oil wells

Sprague Meter Co., 35 South Ave., Bridgeport, Conn.
Liquid meters

Stafford Co., N., 113 53 St., Brooklyn, N. Y.
Nautical, naval & navigational instruments

Stamford Metal Specialty Co., 427 W. Broadway, New York 12, N. Y.
Panels, instrument & radio test, metal stampings

Standard Arcturus Corp., 99 Sussex Ave., Newark, N. J.
Vacuum tubes

Standard Concrete Apparatus Co., 1422 Rhode Island Ave., Washington, D. C.
Concrete testing equipment

Standard Electrical Products Co., 317 Sibley St., St. Paul, Minn.
Relays

Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.
Electric stop clocks, electric time systems, watt hour meter testing equipment, program clocks, laboratory jack panels & small laboratory table service panels.
(See advertisement on page 111)

Standard Engineering Works, 289 N. Main St., Pawtucket, R. I.
Humidistats

Standard Gage Co., Inc., 70 Parker Ave., Poughkeepsie, N. Y.
Gages for linear measurements

Standard Science Supply Co., 1232 N. Paulina St., Chicago 22, Ill.
Electrical insts. & accessories, shunts, meters & transformers

Standard Scientific Supply Corp., 34 W. 4 St., New York, N. Y.
Laboratory supplies

Standard Thermometer, Inc., 65 Shirley St., Boston, Mass.
Mechanical thermometers

Star Brass Mfg. Co., 104 E. Dedham St., Boston, Mass.
Pressure & vacuum gages, gage testers

Star Compass Co., 110 Antwerp St., East Milton, Mass.
Compasses

Starrett Co., L. S., Athol, Mass.
Precision tools, dial indicators & steel tapes
(See advertisement on page 43)

States Co., 19 New Park Ave., Hartford 6, Conn.
Electricity meter testers

Statham Laboratories, 8222 Beverly Blvd., Los Angeles 36, Calif.
Accelerometers, dynamometers, strain gages, flowmeters, pressure indicators, tension indicators

Stebar Co., 711 W. Lake St., Minneapolis 8, Minn.
Microscopes

Steel City Testing Laboratory, 8843 Livernois Ave., Detroit, Mich.
Testing machines

Stephens-Adamson Mfg. Co., 232 Ridgeway, Aurora, Ill.
Automatic bin-level switches

Sterling Engineering Co., 3738 North Holton, Milwaukee, Wisc.
Motor operated valves

Stevens-Arnold Co., 22 Elkins St., So. Boston, Mass.
Relays, frequency & polarized

Stewart, M. C., Ashburnham, Mass.
Meteorological instruments

Stewart-Warner Corp., 1826 Diversey Parkway, Chicago, Ill.
Tachometers

Sticht Co., Inc., Herman H., 27 Park Pl., New York 7, N. Y.
Electrical instruments
(See advertisements on pages 57, 94)

Stillman Co., M. J., Suite 800, 116 So. Michigan Ave., Chicago, Ill.
Stop watches

Stockton Profile Gauge Corp., 165 Jackson St., Lowell, Mass.
Profile gages

Stoelting Co., C. H., 424 N. Homan Ave., Chicago 24, Ill.
Laboratory supplies

Stokes Machine Company, F. J., Tabor Road, Olney, P. O., Philadelphia, Pa.
Special process machinery; pressure & vacuum gages; pellet presses; high vacuum pumps; McLeod vacuum gages; automatic water stills

Stover-Lang Co., 280 Dover St., Boston, Mass.
Tachometers

Streeter-Amet Company, 4101 Ravenswood, Chicago, Ill.
Automatic measuring, weighing & counting machines

Stromberg Time Corp., 109 Lafayette St., New York 13, N. Y.
Timing devices & time clocks

Struthers-Dunn see Dunn

Sturtevant Co., P. A., Addison, Ill.
Torque measuring equipment
(See advertisement on page 96)

Submarine Signal Co., 160 State St., Boston, Mass.
Sounding machines

Summers Gyroscope Co., 1100 Colorado Ave., Santa Monica, Calif.
Automatic pilots, and gyro servos

Sun Electric Corp., 6323 Avondale Ave., Chicago 31, Ill.
Electrical instruments & engine test equipment

Sun Radio & Electronics Company, 122-124 Duane St., New York 7, N. Y.
Authorized distributors for all major manufacturers of radio parts, tubes, meters, radio test equipment, electronic equipment for industrial use, instruments for laboratory and industrial test purposes, and electronic components for the construction of such instruments
(See advertisement on page 133)

Superior Electric Co., Bristol, Conn.
Industrial & laboratory apparatus
(See advertisement on Inside Back Cover)

Superior Instruments Co., 227 Fulton St., New York, N. Y.
Insulation testers; volt, current & resistance measuring instruments

Superior Meter Co., Inc., 167 41st Street, Brooklyn 32, N. Y.
Gas meters & appliances

Supreme Electric Products Corp., 194 Vassar St., Rochester 7, N. Y.
Solenoid valves, electro-magnets

Supreme Instruments Corp., Greenwood, Miss.
Radio testing equipment: tube testers, set testers, analyzers, test oscillators, oscilloscopes & dynamic instruments.
Gages

Surface Checking Gage Co., 1937 Taft Ave., Hollywood 28, Calif.
Surface roughness standards and comparators
(See advertisement on page 44)

Surty Mfg. Co., Inc., 4141 W. Kinzie St., Chicago 24, Ill.
Magnifiers

Suter, Alfred, 200 Fifth Ave., New York, N. Y.
Testing apparatus for textiles and metals

Suverkrop Instruments, Box 463, Bakersfield, Cal.
Drafting & surveying instruments

Swain Nelson Co., Glenview, Ill.
Lenses and optical components

Swedish Gage Co. of America, 8900 Alpine Ave., Detroit 4, Mich.
Internal indicators; plug, ring, master disc & special built fixtures

T

Taber Instrument Co., 111 Goundry St., North Tonawanda, N. Y.
Testers for measuring wear & abrasion resistance of paints, electroplate, linoleum, leather, textiles; precision stiffness gages for paper, light metallic sheet & wire

Taco Engineering Co., 2620 S. Park Ave., Chicago 16, Ill.
Special electronic equipment, electronic controls and automatic machinery

Taglabue, C. J. Division, Portable Products Corporation, Park & Nostrand Aves., Brooklyn 5, N. Y.
Indicating, Recording and Controlling Instruments for Temperature, Pressure, Level, Flow, Humidity; Hydrometers, Chemical Thermometers and Petroleum Testing Instruments; Moisture Meters for Grain, Wood, Tobacco and Granular Materials; Potentiometers, Pyrometers and Resistance Thermometers, Non-Indicating, Recording and Controlling Types; Industrial and Dial-Indicating Thermometers.
(See advertisements on pages 28, 52, 70, 72, 76, 106)

Tally-Meter Co., 17 Elmwood Ave., Norwich, Conn.
Counters & measuring machines

Tamms Silica Co., 228 N. La Salle St., Chicago, Ill.
Pyrometers

Taylor & Co., W. A., 7300 York Road, Baltimore, Md.
Equipment for pH & chlorine control, control of phosphates in boiler water & for water analysis

Taylor Instrument Cos,, 95 Ames St., Rochester 1, N. Y.
Indicating, Recording & Controlling Instruments for Temperature, Humidity, Pressure, Rate of Flow, & Liquid Level

Taylor Mfg. Co., 3056 West Meinecke Ave., Milwaukee, Wis.
Hydraulic dynamometers, static balancing machines, super-accurate drill presses

Technical Products Co., P. O. Box 93, Memphis, Tenn.
Laboratory supply house

Technology Instrument Corp., 1058 Main St., Waltham, Mass.
Special audio equipment

Teichert* Engineering Co., 217-09 Merrick Blvd., Springfield Gardens (Jamaica), L. I., N. Y.
Industrial engineers

Tejax Engineering Corp., 2 Allens Ave., Providence, R. I.
Dial indicating handwheels, valve position indicators & V-port hand regulating valves

Telechron, Inc., Ashland, Mass.
Timers and fractional horsepower motors
(See advertisement on page 7)

Teleoptic Co., Racine, Wis.
Precision screw products, switches & relays

Televiso Products, Inc., 6533 Olmstead Ave., Chicago, Ill.
Electronic products; custom built equipment

Teleweld, Inc., 80 E. Jackson Blvd., Chicago, Ill.
Hardness testers

Tempil Corp., 132 West 22 St., New York, N. Y.
Thermoscopic paint & thermometric sticks

Tenney Engineering, Inc., 46 Farrand St., Bloomfield, N. J.
Controlled temperature & humidity ovens
(See advertisement on page 23)

Terminal Radio Corp., 85 Cortland St. New York 7, N. Y.
Distributors of electronic & sound equipment

Test-A-Tone Co., 274 Madison Ave., New York, N. Y.
Stethoscopes

Testing Machines, Inc., 460 West 34th St., New York, N. Y.
Physical testing machines

Testrite Instrument Co., 57 E. 11th St., New York 3, N. Y.
Scientific instruments

Thermador Electrical Mfg. Co., 5119 District Blvd., Los Angeles 22, Calif.
Transformers

Thermal Syndicate Ltd., 12 East 46th St., New York 17, N. Y.
Apparatus, laboratory; flats, optical; gas & vapor discharge tubes, mercury; light sources, mercury vapor; light sources; ultra-violet; optical parts

Thermo-Electric Co., 1012 W. Superior Ave., Cleveland 13, Ohio
Electrically heated & controlled paraffin baths

Thermo-Electric Co., 22-02 Raphael St., Fair Lawn, N. J.
Thermocouples for aircraft engines & industrial uses, extension lead wires & harnesses
(See advertisement on page 102)

Thermo Electric Manufacturing Co., 840 W. Locust St., Dubuque, Iowa
Laboratory furnaces

Thomas Clocks, Seth, Div. of General Time Instruments Corp., Thomaston, Conn.
Household clocks, outdoor & tower clocks, clock movements for industrial purposes, also electric timers

Thomas Co., Arthur H., West Washington Square, Philadelphia 5, Pa.
Dealers, retail-wholesale-export, in laboratory apparatus & reagents for laboratories of chemistry & biology.

Thompson Balance Co., 802 E. 18 Ave., Denver 5, Colo.
Fine balances & weights

Thompson Clock Co., H. C., Bristol, Conn.
Electric stop clocks & interval timers

Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago 10, Ill.
Transformers

Thwing-Albert Instrument Co., Penn St. at Pulaski Ave., Philadelphia 44, Pa.
Pyrometers, paper testing instruments, portable pH meters, general testing instruments & machines
(See advertisements on pages 68, 69)

Tinsley Laboratories, Inc., 2526 Grove St., Berkeley 4, Calif.
Astronomical instruments

Toledo Scale Co., 3216 Monroe St., Toledo, Ohio
Automatic scales for weighing, counting, check-weighing, compounding, force-measuring, weight-printing & weight-recording; & special devices for testing, classifying & standardizing.

Torsion Balance Co., 92 Reade St., New York 13, N. Y.
See Christian Becker, Inc.

Trerice Co., H. O., 1420 Lafayette Blvd., W., Detroit 16, Mich.
Industrial instruments

Triangle Package Machinery Co., 905 N. Spaulding St., Chicago, Ill.
Filling machines

Trill Indicator Co., 38 E. South St., Corry, Pa.
Engine indicators

Trimount Instrument Company, 37 W. Van Buren St., Chicago 5, Ill.
Manometers: well type, sliding scale U-tube, fixed scale U-tube, inclined, absolute pressure, & service; gages: draft & mercury pressure; indicating flow meters & tank level indicators
(See advertisements on pages 55, 64)

Triner Sales Co., 1440 Merchandise Mart, Chicago, Ill.
Scales

Trinity Equipment & Supply Co., 605 Broad St., Newark 2, N. J.
Thermocouple wells
(See advertisement on page —)

Triplett Electrical Instrument Co., 135 E. College Ave., Bluffton, Ohio
Electrical measuring instruments & radio testing equipment. Also instruments for laboratory and industrial test purposes; switches, relays, resistors, shunts
(See advertisement on page 2)

Triumph Mfg. Co., 913 W. Van Buren St., Chicago 7, Ill.
Radio test instruments

Troemner, Henry, 911 Arch St., Philadelphia, Pa.
Balances

Trubine Mfg. Co., 378 N. Lake St., Pasadena, Calif.
Drawing instruments & drafting machines

U

Uehling Instrument Co., 14 Vesper St., Paterson, N. J.
CO_2 recorders, vacuum recorders, absolute pressure recorders, draft recorders, combined pressure & vacuum recorders, liquid level gages, pressure & vacuum gages, inclined draft gages, well-type direct reading manometers, U-tube manometers, absolute pressure gages
(See advertisement on page 114)

Ulanet Co., George, 413-15 Market St., Newark 5, N. J.
Thermostats

Ulmer Co., J. C., 1791 E. 38th St., Cleveland, Ohio
Surveying instruments

Ultra-Violet Products, Inc., 5205 Santa Monica Blvd., Los Angeles 27, Calif.
Fluorescence and ultra-violet lamps
(See advertisement on page 53)

Umco Mfg. Co., 5718 Santa Fe Ave., Los Angeles 11, Cal.
Electronic circuit analyzers

Unertl Optical Co., John, 3551-3555 East St., Pittsburgh 14, Pa.
Optical instruments
(See advertisement on page 60)

Uniform Tubes, Shurs Lane & Lauriston St., Rox. Philadelphia, Pa.
Precision tubes of all metals
(See advertisement on page 61)

Union Tool Company Orange, Mass.
Machine shop gages

United Cinephone Corp., Torrington, Conn.
Electronic devices

United Electric Controls Co., 71 A St., Boston 27, Mass.
Automatic controllers & thermostats

United Precision Products Corp., 3524 W. Belmont Ave., Chicago, Ill.
Gages

United States Blue Print Paper Co., 207 S. Wabash Ave., Chicago 4, Ill.
Surveying instruments

United States Gauge Co., 44 Beaver St., New York, N. Y.
Indicating & recording pressure gages

United States Instrument Corp., 19 So. Harrison St., E. Orange, N. J
Voice powered telephone equipment

United States Radium Corporation, 535 Pearl St., New York 7, N. Y.
Luminescent dials, pointers & other instrument components
(See advertisements on pages 32, 54, 76)

United Transformer Corp., 150 Varick St., New York, N. Y.
Transformers

Universal Instrument Co., 306 E. McMillan St., Cincinnati 19, Ohio
Radio tube testers & multimeters

University Apparatus Co., 2229 McGee Ave., Berkeley, Calif.
Laboratory supply house

Univis Lens Company, Dayton, Ohio
Optical flats, lenses & prisms

Utah Radio Products Co., 320 W. Ohio St., Chicago 10, Ill.
Resistors, rheostats, switches, transformers, relays, attenuators

V

V & E Manufacturing Co., 748 S. Fair Oaks Ave., Pasadena, Calif.
Drawing instruments

Vacutron, Inc., 2819 12th St. So., Arlington, Va.
Special vacuum tubes; electronic circuits & industrial control devices

Valpey Crystals, P. O. Box 321, Holliston, Mass.
Quartz crystals for frequency control

Valve Pilot Corp., 230 Park Ave., New York, N. Y.
Locomotive speed indicator & recorder and locomotive speed & cut-off indicator & recorder.

Valverde Labs., 91 Crosby St., New York 12, N. Y.
Thermal controls

Van Keuren Co., 12 Copeland St., Watertown, Mass.
Optical comparators & flats

Vapor Recovery Systems Co., 2820 Alameda St., Compton, Calif.
Liquid level indicators

Vard Inc., 2961 E. Colorado, Pasadena, Calif.
Comparator gages, optical flats

Vaughn-G. E. Witt Co., 4224 Hollis St., Oakland, Calif
Regulating valves

V-D Instrument Laboratory, 425 W. Whitmore St., Wilmar, Calif.
Pyrometers & ohmmeters

Veeder-Root, Inc., Sargent & Garden Sts., Hartford 2, Conn.
Electrically operated counting devices, a.c. and d.c.

Veritas Firing System Co., P. O. Box 974, Trenton 6, N. J.
Shrinkage discs for ceramic kiln control

Vickers Inc., 1400 Oakman Blvd., Detroit, Mich.
Pumps & valving devices for control of power in oil-hydraulic systems

Victor Equipment Co., 844-50 Folsom St., San Francisco, Calif.
Absolute pressure gages

Victoreen Instrument Co., 5806 Hough Ave., Cleveland 3, Ohio
Electrometers, spectrometers, vacuum tubes

Viking Instruments Inc., Stamford, Conn.
Tachometers

Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Special gages

Visco-Meter Corp., 315 Grote St., Buffalo, N. Y.
Viscosimeter

Voland & Sons, Inc., New Rochelle, N. Y.
Analytical balances & weights

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•

PAUL G. WEILLER
Engineering Consultants
95 Broad St. New York 4, N. Y.

W

Wadsworth Electric Mfg. Co., Inc., Covington, Ky.
Electric time switches

Wagner & Son, Carl H., 1944 N. Albany Ave., Chicago 47, Ill.
Thermometers

Walker & Co., Geo. T., 324 Fifth Ave., South, Minneapolis, Minn.
Laboratory supplies

Walker-Jimieson, Inc., 311 S. Western Ave., Chicago 12, Ill.
Radio & electronic supplies

Wallace & Tiernan Products Co., Inc., Newark P. O. Box 178, Zone 1, Belleville, N. J.
Chlorine control & chemical feed devices, meteorological instruments

Walser Automatic Timer Co., 420 Lexington Ave., New York, N. Y.
Timers

Waltham Dial Gage Co., Boxboro Road, Waltham, Mass.
Machinist's dial gages

Waltham Watch Co., Waltham, Mass.
Stop watches

Ward Leonard Electric Co., 31 South St., Mount Vernon, N. Y.
Resistors, rheostats, relays, motor starters, speed controllers, voltage regulators, electric control devices

Ward's Natural Science Estab., Inc., 302 N. Goodman St., Rochester, N. Y.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio
Telescopes

Warren-Knight Co., 136 N. 12th St., Philadelphia, Pa.
Surveying instruments & equipment
(See advertisement on page 92)

Warrick Co., Charles F., 16251 Hamilton Ave., Detroit 3, Mich.
Relays & auxiliary equipment for level controls.

Warwick Products Co., 3022 Euclid Ave., Cleveland, Ohio
Wood and covered cases for instruments, tools and gages

Washington Glass Laboratory and Instrument Co., 3224 Georgia Ave., N. W., Washington 11, D. C.
Thermoregulators, thermostats, relays, special glassware
(See advertisements on pages 107, 109)

Water Leak Detector Co., 166 N. Third St., Columbus, Ohio
Water leak detectors

Water Level Controls Co., 765 Hampden Ave., St. Paul, Minn.
Liquid level controls

Waterman Products Co., Inc. 2445 Emerald St., Philadelphia 25, Pa.
Portable oscillographs
(See advertisement on page 64)

Watts Regulator Co., 10 Embankment St., Lawrence, Mass.
Automatic pressure regulating devices

Waugh Laboratories, Division of Waugh Equipment Co., 420 Lexington Ave., New York 17, N. Y.
Engineering field service for stress & vibration determination, instruments sale or rental basis, instruments designed & built.

Wayne Automatic Relay Co., 622 Wagner, Fort Wayne, Ind.
Photoelectric counters

Webber Gage Co., 12904 Triskett Rd., Cleveland 11, Ohio
Gage blocks
(See advertisement on page 41)

Weber Bros., Metal Works, 108 N. Jefferson St., Chicago, Ill.
Laboratory apparatus

Weber & Co., F., 1220 Buttonwood St., Philadelphia 23, Pa.
Mathematical & surveying instruments

Weksler Thermometer Corp., 52-56 West Houston St., New York 12, N. Y.
Thermometers, hydrometers, psychrometers
(See advertisement on page 105)

Welch Engineering Service, F. M., Greenville, Ohio
Abrasion testing machines

Welch Scientific Co., W. M., 1515 Sedgwick St., Chicago 10, Ill.
Electrical instruments, vacuum pumps & items for science laboratories.
(See advertisement on page 15)

West & Dodge Thread Gauge Co., Inc., 6 Power House St., South Boston, Mass.
Screw thread gages

Western Electric Co., 120 Broadway, New York 5, N. Y.
Instruments are offered for acoustic, noise or vibration control problems, in the product development laboratory, for field testing and for routine production testing applications
Instruments distributed by Graybar Electric Co., 420 Lexington Ave.

Western Electro-Mechanical Co. Inc., 300 Broadway, Oakland, Calif.
Load testing devices for a-c. circuits

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